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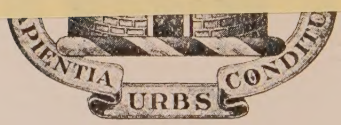

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THE MENTAL LIFE

A SURVEY OF MODERN EXPERIMENTAL PSYCHOLOGY

Longmans' Psychology Series

General Editor

HARVEY A. CARR

Professor of Psychology in the University of Chicago

PSYCHOLOGY — A Study of Mental Activity. *By* HARVEY A. CARR.

STATISTICS IN PSYCHOLOGY AND EDUCATION. *By* HENRY E. GARRETT, *Assistant Professor of Psychology, Columbia University.*

THE MENTAL LIFE. *By* CHRISTIAN A. RUCKMICK, *Professor of Psychology, University of Iowa.*

Other Volumes in Preparation.

FIG. 1. THE BOUNDARY BETWEEN THE MENTAL AND THE PHYSICAL WORLDS

Longmans' Psychology Series

THE MENTAL LIFE

A SURVEY OF MODERN EXPERIMENTAL PSYCHOLOGY

BY

CHRISTIAN A. RUCKMICK, PH.D.

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NOTTINGHAM.

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RUCKMICK

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FIRST EDITION

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MADE IN THE UNITED STATES OF AMERICA

PREFACE

In the face of a constantly increasing list of usable texts, this book has been written to meet two distinct demands. There is need at present for a concise text to be used in connection with elementary courses in psychology in the summer sessions of our universities, in our college courses, and in the normal schools. There is need also in our universities for an introduction to psychology which may be used in conjunction with one or more other texts. In many academic courses the lecturer supplies most of the detailed facts in connection with his own theoretical background. Often a mimeographed outline is provided. The present text offers a complete systematic presentation outside of these additional sources of reference.

A second demand for such a book comes from the general reader. In ever-increasing numbers requests are made for a readable outline of the elementary facts of psychology from individuals not enrolled as students in our colleges and universities who nevertheless desire to be well-informed about the science of psychology. The

book therefore aims to be more than a text without at the same time misstating facts.

With this purpose in view, the author has for the most part sought non-technical examples and diagrams in connection with the study of mental processes and operations and has attempted at every turn to avoid the all-too-current pedantic language of the classroom. The material on sensations has been very much condensed. Historically, of course, there is much available material in this field. But the writer feels that in a systematic treatment the facts of sensation are generally overemphasized.

Realizing that the book itself is a fairly brief survey and that the reader may want to continue in one or more of the special fields, the author has added an extensive Bibliography at the end with brief comments in many cases.

The author is indebted to several of his colleagues who have made suggestions looking toward the improvement of the book; to the C. H. Stoelting Company of Chicago for permission to use the copyrighted portraits of emotions made by the author; to Professor H. A. Carr for his helpful suggestions as editor of "Longmans' Psychology Series"; to various authors for the use of illustrative material; to the *American Journal of Psychology* for allowing him to reproduce with slight changes the "touch pyramid"; to the *Jour-*

nal of Comparative Psychology, and to Houghton Mifflin Company for the courtesy of reprinting two learning curves, and to the Psychological Review Company for permission to use a chart previously published in an article by the author.

Christian A. Ruckmick.

Iowa City, Iowa.

EDITOR'S INTRODUCTION

This volume is the third of a Series which will include texts representing all special topics and branches of psychology and all distinctive points of view in the field of systematic psychology.

Professor Ruckmick's account of the phenomena of mental life is representative of a distinctive point of view which has played an influential role in the history of American psychology and which has many sympathizers and adherents among present-day psychologists.

The manuscript was prepared as a series of lectures which were delivered to a popular audience. In adapting the manuscript to the more formal requirements of a book, the author attempted to preserve as much as possible this popular mode of presentation. Professor Ruckmick has admirably succeeded in this difficult task of combining a free, easy and popular style with precision, accuracy and dignity of statement and still preserving a scholarly organization of the material.

Harvey A. Carr.

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"The temptation to confound accumulated knowledge and experience with intrinsic progress is almost irresistible; but it must be resisted. It is quite unnecessary to go to Australia or Central Africa to find the savage; he is our next-door neighbour. The mentality of the stone age exists on our platforms and in our pulpits. There is no superstition too absurd to find credence in modern England; fetishes and tabus dominate London drawing-rooms. Dr. Malinowski's sojourn in Melanesia has convinced him that the mental processes of the South Sea islanders are very like those of Europeans. It is probably only politeness that prevented him from adding that a return to civilisation has convinced him that the mental processes of Europeans are very like those of Melanesians."—Dean W. R. Inge in "Science, Religion and Reality."

THE MENTAL LIFE

CHAPTER I

INTRODUCTION

Demetrius, upon the taking of Meggara asked Stilpo, the Philosopher, what he had lost. "Nothing," said he, "for I had all that I could call my own about me." And yet the enemy had then made himself the master of his patrimony, his children, and his country.

—Seneca, *Moral by Way of Abstract.*

1. THE NATURE OF PSYCHOLOGY

Descartes, one of the most inquisitive of French thinkers, several hundred years ago wrote the Magna Charta for psychology. The conclusions reached through his own incisive study gave psychology for all time the right to exist. In view of persistent attempts in certain quarters to merge psychology with the physical or even the biological sciences, we might profitably review his line of reasoning. Descartes mentally rebelled against accepting truth on authority and so he inquired about the source of his knowledge of the world, aside from the dogmatic state-

ments of others. All knowledge of the physical universe came, he found, through his sensory experiences, but he was reminded that his senses were subject to illusions. How could he know when they were bearing him true testimony and when they were bearing him false witness? He was left in a quandary. The only approach to the universe outside of dogmatism was unsafe. He had now but one recourse—that was to become a doubter, a skeptic. A single solace, however, remained firm as a foundation of stone: he knew that he was doubting. He, the doubter, was there! Translated from his own words, "I think, therefore I am"; and from that sound fact he built up his system of thought.

In our own language we would say that even if one should question the known existence of the universe, the experiencing of that question and the awareness of the individual who asks it remain unquestioned. While you may not be at all inclined to do so, you who are reading these words might doubt the real existence of the book before you and of the walls and chairs about you. Of course, we should not seriously advise you to doubt the real existence of the chair on which you may be sitting, but one thing which you simply can not rationally deny is that you are seeing the words as you read. Let us agree, if you like, that you may conceivably doubt the truth of what

is printed here, but that you are seeing it, or even parts of it, if you are attending to the matter in hand, is a fact beyond dispute. Such experiences, of which there are many varieties, are the foundation-stones upon which psychology builds its edifice. It assumes, what can not be safely gainsaid, that experience not only exists but that no science, save psychology, adequately deals with this phase of reality. It has been well said that psychology describes "the world as it is in man's experience, as it appears with man left in."[1]

In the very beginning, however, lest we misunderstand each other, we must make some frank statements about the way in which psychology discusses these experiences. Such precautions would not be necessary were it not for two outstanding difficulties. First of all, psychology is perhaps the youngest science to emerge from the parental care of philosophy. Some think that it has not yet reached maturity and therefore a few of its relatives have fondly called it all sorts of pet names,—yes even nicknames,—many of which are attached to early characteristics which have since been outgrown. From pulpit, press, and

[1] An amusing anecdote has recently appeared in one of our magazines giving a clear road to the introspective method. A young boy who had been punished for excessively scratching himself said to a little girl, "Mary, why are you scratching yourself?" She replied naively, "Because no one knows better than I do where I itch."

platform we hear so much about "the" psychology of one thing or another that we are often inclined to agree with someone who has waggishly said "that psychology, my boy, is a word which we use when explaining gets to be difficult." In many ways, not known to the general public, psychology has not only established its maturity as a grown-up brother to the other sciences but it can point with pride to very definite achievements in the understanding of the mind of man. Psychologists, nevertheless, are loath to speak of "the" psychology of this, that and the other thing,—much more loath than the lay lecturers, who often entertain the public at its own expense. Least of all, will they admit that psychology is a panacea for all public and private ills, or that it can give a final answer at present to many of the outstanding questions which present themselves persistently in the realm of experience.

The second reason for misunderstanding the psychological approach to experience lies in the fact that each one of us from very early days has had a certain semi-psychological interest in the affairs of his own experiences. Our minds, with us from morning until night and from infancy to old age, have often been in themselves interesting objects of study. We have all sometime or other discussed our dreams, the inadequacy of our memory, or the tunes "that run through our heads."

But few of us have had the opportunity to take the impersonal, or what is sometimes known as the "objective" attitude, to study these mental processes apart from our own individual interests and evaluations. Now and again a school-teacher consults the psychologist and with a great deal of enthusiasm asks him whether he would not be interested in some peculiar manifestations which she has had. In all such cases, and in many other instances that come to us as part of the day's work, we have to remind ourselves that psychological investigation in its scientific aspect involves divorcement of personal contact. Peculiarities, when they do occur, are simply interesting variations of the typical minds which we already know and somewhat understand just as some peculiar stratification of rock may interest the geologist in comparison with the normal formations with which he is generally acquainted.

With these notes of warning before us we can safely proceed to tell more specifically what psychology studies. Experiences wherever found, among the lower animals or the highest animal of all—the human being—and in all of their varieties, are searched, described, and classified to the end that mind shall be ultimately as well understood as the physical phenomena which physics and chemistry scientifically study. Figure 1 indicates the difference between physical object and

psychical experience. The ink-blots were made with no effort to portray anything. Physically they are splotches of black on white. Mentally there arise a large number of perceived things, *e.g.*, faces, animals, and plants with accompanying emotional disturbances of interest and pleasure. Similar experiences occur in connection with shadows in the full moon, with clouds, and with masses of smoke and steam, especially with curls of smoke rising in the fireplace. Psychology is concerned with just such experiences as these. There is no other science which could adequately portray mental occurrences of the type illustrated in this diagram.

Psychologists believe, in other words, that the world would not be completely understood unless there were also included a scientific account of the motives that urge men to their tasks, the thoughts that develop as they work, the emotions that are aroused when pleasant surprises greet them on festive occasions, the pains that they feel when they are unwell, and the dreams which pass in review in the night. All of these things, and many others too, are stern realities. Many physical objects in this world are moved from place to place, or altogether annihilated in their present form when men are stirred with passion or urged on with enthusiasm. What world calamities are precipitated through men's fear and hate! What drudgery do we not gladly undertake for the sake of friends whom we love!

2. DEFINITION

All of these statements we can fit together in a formal way by defining psychology as the *science of experience.* The definition indicates that our investigation and description must be primarily scientific. For instance, the experiences described in the previous paragraph might be viewed with various attitudes. The poet is also interested in the experiences of mankind and in his way he too describes them; the clergyman is interested in human happenings, and he also would deal with them; the social worker is engaged in scrutinizing the mental lay of the land and he, too, would take them into account in making readjustments; and the physician often makes mental diagnoses and uses them in curing his patients. But the psychologist maintains that for the sake of an accurate, bold, and true account of experience he must keep his scientific description for the moment clear of appreciation, clear of immediate application, and clear of any other arbitrary evaluation. He must be trained impartially to see what is so and what is not so from his angle of observation. Thus he is persuaded to investigate experience as far as possible under the isolated surroundings of the laboratory. Here mental events may be analyzed under conditions that may be controlled, varied, and repeated. By suitable and sometimes very ingenious means he can produce and isolate within

reasonable limits practically any experience that occurs in the outside world. He can regulate the conditions under which this experience shall appear and therefore can repeat the observation as often as becomes necessary. Almost all of our universities and colleges the world over possess some sort of psychological laboratory with neatly devised apparatus of all kinds and generally equipped to train students how to use these instruments along psychological lines.[2] While this is the usual method of obtaining facts for published articles and treatises, it is by no means necessary to have a laboratory for the psychological investigation of mental phenomena. Hundreds of laboratories and hundreds of thousands of dollars' worth of apparatus do not make a science, but with scientific training and method one may do a neat bit of analysis almost anywhere one chooses. Some crude form of experimentation might be carried on outside the laboratory. But even then the results should be checked over by careful observation under more restricted laboratory conditions. Our modern trend is away from uncontrolled "arm-chair" observations and toward standardized laboratory procedures.

[2] The manufacturers of psychological apparatus in this country state that many thousands of dollars' worth of apparatus are being yearly exported from this country to Australia, China, Japan, India, New Zealand, Panama, Peru, Portugal, Russia, and South Africa.

3. METHODS AND PROCEDURES

Again psychology has been misunderstood in terms of its supposedly specialized methods. Many writers of culture have assumed that introspection is a sort of morbid self-reflection, bound to do harm to the individual and, if it were generally adopted, assuredly dangerous to society as a whole. Nothing could be further from the fact. We have seen that when a psychologist regards even his own mind he has learned to take an impersonal point of view. The observation of mental processes has apparently neither undermined the bodily health of psychologists nor unsettled the poise of their minds. A group of psychologists gathered at their annual conventions would certainly not give the casual observer the impression of abnormally twisted beings. Many of the larger industrial establishments, moreover, have put psychologists on their staffs and several of our number rank as executive officers of large industrial concerns and of institutions of higher learning. Some years ago a published article showed the proportionately large number of psychologists who had become administrative officers of colleges and universities.[3]

The point is that introspection, which literally means "looking within," is no more of a "looking

[3] "Psychologists as Administrators," *Science*, 37, 1913, 972–973.

within'' the mind to discover elementary mental processes than an observation of the molecule in physics which reveal the electrically charged ions and protons is ''looking within'' the molecule. There is a movement on foot in psychology to eliminate the word *introspection,* since it has developed these spurious connotations, and to use for our science a term that represents the same observational methods that are used in other sciences. The only difference then will be the point of view from which one observes.

We shall, therefore, use *observation* throughout in place of *introspection.* Observation will then mean (1) the analysis of complex experiences into their fundamentals, and (2) the report of this analysis in the terms generally adopted by the science of psychology. Of course, this two-fold division is somewhat of an artifact in that with a little training the original observation readily falls under the terminology used in the science. A botanist observing a flower already observes stamens, pistils, petals and sepals, and so the psychologist in observing a mental event tends to make his observational analysis in the classifications adopted by his profession. In some instances special procedures have to be adopted for the investigation of specific processes, but it is wiser to wait until the special problems are presented before we discuss in detail the procedures used in these cases.

4. SUMMARY

We have briefly surveyed the basis for psychology by pointing out the need of investigating experience on the same scientific level that other sciences investigate problems of the physical universe. Psychology, as the *science of experience,* aims to take an impersonal attitude toward the awareness of our everyday life and wherever possible to investigate these under conditions of experimental control, variation and repetition in the laboratory. There it uses the method of *observation* which reduces the complexities of mental phenomena to their fundamental realities and describes them in psychological terminology. The only difference, then, is the material with which the science works. This it observes from an impartial and impersonal attitude.

REVIEW QUESTIONS

1. What is the study-table or desk (*a*) from the *physical* point of view?
   (*b*) from the *mental* point of view?
2. (*a*) Give at least four ways in which you think psychology has been of service to other professions.
   (*b*) What can psychology *not* accomplish or explain at the present time?
3. (*a*) Mention two or three mental facts about yourself in which you have been personally interested.
   (*b*) In what way would the psychologist be interested in these same experiences?
4. Write out a psychological observation of one of your recent experiences and keep this on file until you have read the

entire book. At that time criticize both your *words* and your *observations*.

5. (*a*) Define (1) psychology (2) observation.
   (*b*) Who was Descartes and what did he accomplish for psychology?

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Note: Three students in the laboratory contributed this list of objects perceived in the frontispiece:

amoeba
ancient amphibian
Arab
badge
bear
bear, looked at from on top (upside down)
bow-knot funeral wreath
bow tie
buffalo or bison
child sitting
child's profile
clouds
dog
dog's head
dog, sitting up
father Neptune
feminine profile

fish's mouth
head and shoulders of girl painting
headless dress model
head with crown
mug
old fashioned woman with muff
owl
profile of man with beard
pug-nosed child
puppy standing up
rabbit's head
satyr's face
sponge
woman in bonnet
woman's face
woman with large head and hands on hips
woman with shawl over her head

CHAPTER II

PRELIMINARY PROBLEMS

"Modern psychology, within the last quarter of a century, has more and more assumed the aspects of an exact science; and so practical is it becoming that it has begun, slowly but surely, to bring the art of self knowledge to the American people. I do not see how much knowledge can fail to bear fruit, nor how the truth, once known, can finally fail to make us free."

—Ben B. Lindsey, "The Revolt of Modern Youth."

5. RELATIONSHIP BETWEEN MIND AND BODY

Granted that psychology is best defined as the *science of experience* and that it observes experience from an impartial and analytic point of view, we are at once face to face with the problem, how this experience arises and in what ways it is controlled and modified. For many ages people have tried to understand the relationship between mind and the rest of the universe. One of the most important of these questions is the relationship between mind and body. Since the term *soul* has assumed religious and especially theological meanings, the psychologist is no longer willing to use it in a discussion of experience and deals with mind

only as it occurs during the lifetime of the body. That is to say, the immortal aspects of spiritual life, whatever they may be, can not be brought within the reach of scientific experimentation and description. Scarcely any present-day textbooks in psychology mention the soul at all.

It must be understood of course that this refusal to portray the soul is not to be construed as an outright denial of the soul. A great many psychologists are as firmly convinced of the reality of the soul in their religion as any one could well be, but they believe that a concept which involves chiefly a religious aspect can not be used in connection with experiments in the laboratory. The reality of the soul has not been scientifically proved at present, but anyone who has studied the logical procedures of science knows that there are excellent proofs outside of scientific ones. Perhaps the time will come when we shall not try to establish everything solely by scientific methods but will realize that science follows but one of several avenues to truth.

Strictly speaking, the relationship between mind and body is not a subject for investigation in psychology, since philosophy is much better equipped to discuss them from a neutral and therefore from an impartial point of view. Indeed, philosophy investigates the relationships between all of the sciences and between all of the realities that

these disciplines describe, each from its circumscribed sphere of study. Psychology assumes the reality of mind just as anatomy and physiology assume the reality of the body while the relationship between mind and body is not properly discussed in any one of those sciences. It should therefore demand only passing notice here. We are concerned with it only when we push further our quest for an adequate *explanation* of many experiences that occur. Physiological or biological relationships can not give us any new *facts* concerning mind, but only reasons for its existence and function.

For one thing, of course, we could not have the experiences which we do have unless a living organism is assumed. Fundamentally all of our experiences depend upon the sense-organs. Any modifications of these sense-organs or the elimination of any one of them radically changes experience. A man absolutely blind from birth, or even after the first few years of life, lacks part of the mental equipment of the normal individual. His mind in this respect is different. Moreover, any typical modifications of the body, such as are found, for instance, in the lower animal forms, make us presuppose at once a different type of experience. Refined sensory equipment as against immense muscular development certainly must affect the mental life. Radical or temporary dis-

turbances of the body, as during fainting, in dreamless sleep, after injury to the head, or from the effect of drugs, may eliminate or modify experience altogether. In more ways, then, than we can recount in this short space, we are certain that mind and body are very closely affiliated. Of course we must not forget, too, that, conversely, mental disturbances seem to produce bodily changes. The worry over a lost pocketbook may affect digestion, circulation and other bodily processes.

While we are not willing to commit ourselves to any one of them we may say that at least four different views have recently been held in regard to the mind-body relationship. They are:

(1) **Interactionism.** This theory assumes that mind initiates the changes that occur in the body and that the body in turn effects changes in the mind. A given writer might hold to both of these aspects, or to either of them. In everyday life it is commonly assumed that mind and body influence each other in this way. That mental embarrassment causes blushing and a cold in the head makes you stupid are unquestioned facts in daily conversation.

(2) **Parallelism.** This view states that the two sets of facts, mind on the one side and body on the other, run parallel courses and thus are coordinate events. Effects in one are not conceived of as

being caused by changes in the other, but rather to be accompanied by effects in the other. A torpid liver might itself be the result or effect of a series of causes in the physiological system of the body. That condition might be accompanied by mental sluggishness, which in its turn would have a series of causes in the mental life. No attempt is made to charge either the mind with responsibility for changes in the body or the body with responsibility for changes in the mind. It is simply said that they belong together.

(3) **Double aspectivism.** In this theory one is inclined to become monistic in his philosophy and to assume only one reality with two aspects, depending upon the angle from which it is viewed. Like a coin with two faces, one would see only the one aspect from one side and the obverse from the other side. Never, except by reflected rays, can both faces be seen at once. And so it is with mind and body. From his point of view the physiologist sees only body,—while from the psychologist's standpoint only the mind is observed.

(4) **Unitarism.** Under this heading can be put the writers who assume either that the mind and body are both physical or that they are both made of the same stuff that ideas and dreams are made of. One may conceive of the body as being made of the same material as the mind; or conversely, one may conceive of the mind as being made of

the same material as the body. These theories result in different solutions, depending upon whether one holds to the essential reality of physical substance or to the essential reality of mental processes. A colleague with whom the writer used to discuss subjects of this sort, once remarked, "Well, it doesn't *matter*." When he was asked, "What doesn't matter?" he said, "Never *mind*."

For our purpose it is enough to recognize that these problems exist, that they can not be solved in psychology proper as such, but that many phases of experience logically demand a theory of some sort for their explanation. It is most important that we should recognize the difference between mind and body and that we should not confuse our terms. One of the common errors made by elementary students is to locate the mind in the brain. This would be, in effect, the enclosure of something which has no physical dimensions in a place that has physical dimensions. To that error at least we can not easily fall heir in view of the preceding discussion. Mind requires the presence of a living organism and is modified through any changes that occur in that organism.

6. RELATION BETWEEN MIND AND ENVIRONMENT

On equal terms with the presence of the body itself is the existence of changes in the environment. It has been said that if our environment

should include a constantly sounding tone, which would not vary in pitch or in intensity or in any other conceivable attribute, then we would not sense the tone. Changes which occur in the environment are the conveyors of energy to the sense organs, which in turn give us sensations. More than that, experience grows with change in environment. The same set of stimuli day in and day out would not lead to a highly cultivated mind. A certain amount of change of environment is necessary for the growth of mind. This effect has been noted many times among peoples who are found in mountain valleys that are shut off from natural connections with the outside world. When the mental development of these peoples is compared with those who live a nomadic life, or who live at least on broad areas where travel is easier, it is almost a foregone conclusion, other conditions being similar, that the former will be stunted in mental growth, whereas the latter will be mentally more highly developed.[1] One of the reasons some-

[1] Dr. E. Blackwelder gives an excellent example of this sort of influence in one of his reports to the Smithsonian Institution. "By this succession of events the surface of China is believed to have reached its modern condition. We may now consider it piecemeal and see how the existing geologic conditions, which are the result of this long series of past changes, influence the habits, occupations, and even mental traits of the people." . . . "The relative freedom of communication in this great plain of the Yellow River has helped to bring about a greater homogeneity in the people than in any other equally large part of China. Here we find a single dialect in use over the entire region, whereas in

times often given for the intellectual keenness of the Jewish race is that it has been forever buffeted about, working against all sorts of odds, and that by this means it has attained a certain mental acumen.

Our purpose in calling attention to these changes in the environment is to avoid confusion. They are realities that must be kept distinct in spite of our common sense attitude toward the objects of experience. One of the most difficult things to learn in psychology is not to mistake the object which we assume was the cause of our experience for the experience itself. In fact, so frequently is this done that it has been technically expressed as the *stimulus error*. The light waves which bring this printed page to your eyes are not the same as the sensations which you receive. No amount of analysis of your sensations would detect these light waves. These are the product of physical analysis with physical instruments. One of the hardest facts to learn in elementary physics is that white light contains the light waves of all

some parts of southern China the natives of even adjacent valleys speak languages almost unintelligible to each other. The other common effects of isolation, such as the lack of acquaintance with the customs of outside peoples, the hatred of foreigners, the peculiar local usages, and many other things, are less prominent here than in other parts of the empire. Excepting the coastal cities, there is no safer part of China for foreigners to travel through.'' *Annual Report of the Smithsonian Institution*, 1913, pp. 389, 392.

the colors. Nor are the sensations which you are experiencing located on the surface of this paper. They are nowhere else but in your own mind. Our contacts with the outside world make it useful for us to ascribe our experience to objects outside of us, and we are constantly in the habit of assigning those experiences to such objects. The Greeks even thought that small copies came from the objects and somehow traveled through the pores of the sense-organs and through pathways in the brain to produce those sensations in us. The attitude of the psychologist is rather to analyze the experience itself and not the object which caused the experience. If something is causing a crawling sensation down the middle of your back, you as a psychologist should be interested in the analysis of the experience, not in finding out what is crawling down your back! And so it is with all of the other mental processes, even those on the higher levels of thought. Naturally our human curiosity has to be met. Very often in our experiments after our observers have gone through certain experiences we show them the apparatus, sometimes very intricate, which produced these effects. But the last thing that the psychologist should do as an observer is to infer that because mental processes are occurring, the objects which caused these experiences are to be described.

7. DELIMITATION OF TERMS

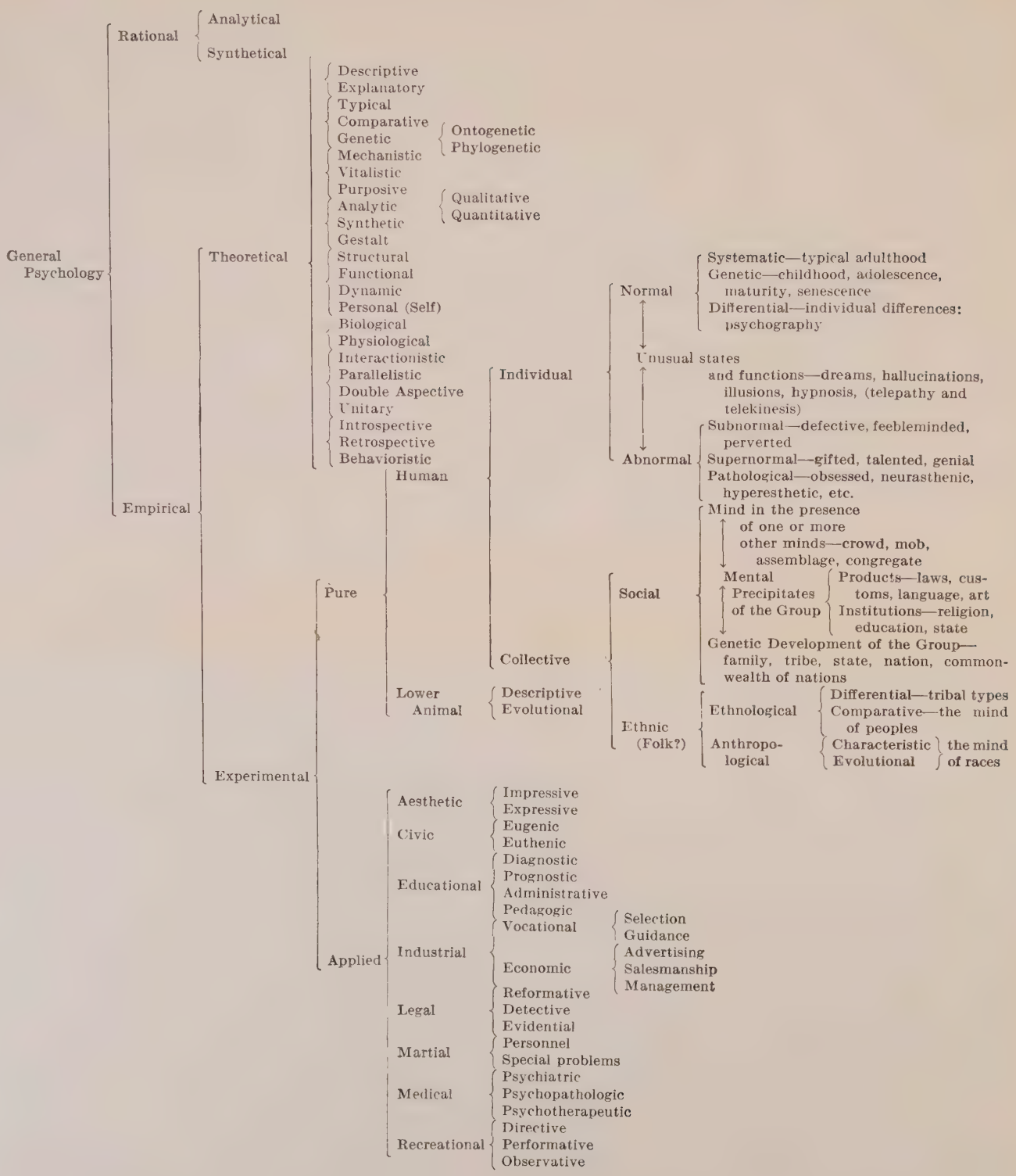
We are constantly using terms like *experience, consciousness* and *mind* in common parlance and often we are using them interchangeably. The writer has thus preferred the term *experience,* in view of the confusion that has arisen with the term *consciousness.* A special weakness of the latter word is that it requires the preposition *of* in place of the direct object. This has given rise to much controversy about the relationship of the subject who is conscious and the object of which he is conscious. To avoid such misunderstandings we shall use the term *experience,* which has nowhere, so far as we know, any other meaning but awareness. Certainly sticks and stones do not have experiences even in our everyday sense of the term. The connotation implied by consciousness or awareness is indefinable. It is one of those ultimates with which every science must start on unproved premises. Certainly no one would consistently deny that consciousness or awareness or experience really exist. The three terms, consciousness, awareness and experience, then, are practically synonymous. But we have to deal with the term *mind* on a different plane. Mind is usually considered as something more complex in its organization, lasting longer and more comprehensive in

its scope, than experience. Even popular speech acknowledges this when we recall expressions like "losing consciousness" as compared with "losing one's mind." We shall, therefore, consider mind as the accumulated organization of experiences, from birth to any period of life in the individual. The mind of any individual is the total set of *conscious responses to the environment that are organized for potential or actual use at any one given moment in that individual's lifetime.*

8. SCOPE OF PSYCHOLOGY

General psychology covers many branches of activity. For the sake of clearness and as an aid to visualization the writer has drawn up the accompanying schema. It shows at once the many activities of present-day psychology and the many interrelations especially between contiguous fields of research. Disregarding the historical division of *empirical psychology,* the basis of all scientific procedure, and *rational psychology,* which was speculative and has recently practically disappeared, we find that today there are two main divisions,—*human* and lower *animal psychology.* Human psychology which is by far the most important is divided again into *individual psychology* and *collective psychology.* Individual psychology develops into a discussion of the normal individual, either from the *systematic* point of view,

SCHEMATIC CLASSIFICATION OF GENERAL PSYCHOLOGY



which describes the typical adult mind, or from the genetic point of view, which determines individual variations either by means of mental tests or through other methods. The *abnormal* branch of *individual psychology* discusses the subnormal, which includes the defective, feebleminded and perverted individual; the supernormal, which includes the gifted, the talented, and the genial; and the pathological type which includes the obsessed, neuræsthenic, and hyperæsthenic. Branches of individual psychology also discuss unusual states and functions, such as dreams, hallucinations, illusions, hypnosis and sometimes telepathy.

Collective psychology goes at once into the social aspects of mind when it is influenced by the presence of one or more other minds, as in the crowd, mob or assemblage. In this branch of psychology, also, certain products of these groups, like laws, customs, languages, and arts, and their institutions, like religion, education, and state, are described and discussed. Besides, one might discuss the ethnological development of tribal types, the mind of races and of peoples. Much progress has also been made in the study of animal minds from the lowest form in the amoeba and paramecium to the higher stages in the apes and chimpanzees. Special procedures have been devised to observe the behavior of these animals under the influence of rewards and punishment,

but in the last analysis their behavior means little unless it is interpreted in the light of human experience.[2]

Much is written today about *applied psychology*[3] and indeed much good has come out of the application of psychological facts to various fields of human endeavor. One might mention among them the following divisions of applied psychology:

(1) The *æsthetic* division, which deals with the interpretation of the minds of musicians, painters, and sculptors, as well as the minds impressed by *æsthetic* products.

(2) The *civic* division which includes the bearing of psychology on the programs of eugenics, or the art and science of being well born, and of euthenics, or the art and science of suitable environment.

(3) The *educational* division where much progress has been made in the diagnosis of the mind of the pupil, in prognostic measures, and in the interpretation of administrative and pedagogical problems.

[2] Italicized words refer directly to the chart. Some of the terms of the chart are not further explained because they involve advanced knowledge of psychology. For a complete understanding of the chart the reader is referred to a recently published article by the writer in the *Psychological Review*, 33, 1926, 397–406.

[3] A selected bibliography at the end of the book gives opportunities for further reading under the several major branches of psychology.

(4) The *industrial* division in which the chief contributions have been along the lines of vocational selection and to some extent of vocational guidance. Contributions are also well under way in the field of advertising and of salesmanship.

(5) The *legal* division where there has been much discussion but not much actual realization of the benefits of psychology in law. Proposals have been made for the detection of criminals, for the weighing of testimony and for the reformation of prisoners. Much is to be expected in the future but not much can be credited either to present or past psychological contributions to law.

(6) The *martial* division in which during the war great strides were made in the classification of personnel through objective tests and in solutions of special problems of aviation and submarine warfare, from the psychological point of view.

(7) The *medical* division, where are classified psychiatry, or the care and treatment of mental abnormalities, as well as the study of these peculiarities, psychopathology, the study of mental disease itself and psychotherapeutics, the care of both mental and bodily diseases through mental means,—these have all drawn heavily on the stock of knowledge contributed by psychology, as well as by the science of medicine itself.

(8) The *recreational* division in terms of which we have more recently heard about the psychology

of athletics. It is to be expected that phenomena, such as the instinctive performances in games, the question of following a leader, and a great variety of problems that arise in coaching, should secure the attention of, and be answered by, trained psychologists.

In brief, just as pure physics has done much to aid civilization and has indeed caused civilization to make enormous progress in the fields of mechanical, civil and electrical engineering, so pure psychology has opened its doors to anyone who wishes to apply the facts that are ready at hand. Although the application of knowledge gained in pure psychology often brings pressure to bear in certain realms of systematic thinking, pure psychology is in itself not directly concerned with the practical aspects of any of the facts which are discovered in its laboratory. Strictly speaking, there is no applied psychology in the sense of a separate science. Applied psychology is best interpreted as an application of psychology to the world of human needs and endeavors.

9. SUMMARY

We have briefly considered the relationship between mind, body and environment to the end that we can distinguish each one of these concepts from the other. Mind is found only in living organisms and depends, therefore, upon animal life not only for its own existence but for the extent

of its development. In certain measure this may be said also of the environment, because sensory organs usually will not respond unless stimulated from without. But again, the psychologist should not confuse the issue and should keep each one of these realities distinct. *Experience* we have found to be synonymous with *consciousness* and *awareness* and free of many of the objections. While it is impossible of definition, everyone admits its existence. *Mind* is conceived of as a progressive development of experience in an organism during the lifetime of the individual. Then, we have sketched the ramifications of psychology into all the corners of the mental universe. Finally, we made the distinction between pure psychology whose aim is to understand ever more clearly what mind is, regardless of the applications of that knowledge, and applied psychology which brings to bear all available knowledge of mind in the various spheres of everyday human activity.

REVIEW QUESTIONS

1. (*a*) What is *your own* definition of the soul? Of the mind?
   (*b*) What features of the "soul" are non-scientific?
2. (*a*) How would you *explain* the fact that swinging around in a circle makes most people dizzy?
   (*b*) Illustrate the various theories of mind-body relationship in terms of some familiar experience.
3. (*a*) Under what branches of psychology would the mental effects of a religious revival meeting be appropriately discussed?
   (*b*) What types of psychology could be applied to the

investigation of raising funds for a charitable enterprise?

4. (*a*) What do you understand by *hypnosis, dream, insanity, genius, telepathy?*
   (*b*) Distinguish between the *experience* of eating, the physiological *effects* of eating, and the *chemical analysis* of food.
5. (*a*) How would a person who has been blind from birth "remember" his last summer's experiences?
   (*b*) Compare the mind of a deaf-mute with your own when you are enjoying a beautiful sunset scene.

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CHAPTER III

SENSORY EXPERIENCE

"First, our senses, conversant about particular sensible objects, do convey into the mind several distinct perceptions of things, according to those various ways wherein those objects do affect them: and thus we come by those ideas we have, of yellow, white, heat, cold, soft, hard, bitter, sweet, and all those which we call sensible qualities; which when I say the senses convey in the mind I mean, they from external objects convey into the mind what produces there those perceptions. This great source of most of the ideas we have depending wholly upon our senses, and derived by them to the understanding, I call SENSATION."
—LOCKE, "An Essay Concerning Human Understanding."

10. BASIS OF EXPERIENCE

AFTER this preliminary discussion there is really no better way to understand psychology than to study section by section the material that goes to make up a typical handbook of the subject. Each one of the dozens of textbooks that are now available treats of experience or its equivalent in its own individual manner. The order of presentation of topics is different in each one and the points selected for discussion vary in emphasis. We have

chosen to treat sensory experience first because Locke was quite right in his statement that no knowledge comes directly to man except first through the senses. We have made certain slight changes in what was perhaps too definite a claim on his part. Thus we now suppose that there are some innate tendencies expressed in the inherited modifications of the nervous system, such as are apparent in instinctive actions, but so far as definite ideas of the world are concerned they obviously come only through sensory experience. We have discussed this subject before when we showed how mind depends upon body and upon environment. Now we are to carry out our program and investigate the immediate pathways through which experience is derived.

11. QUALITATIVE CLASSIFICATION

Aristotle, who lived several centuries before Christ and who wrote one of the earliest treatises on the mind, described us as having five senses—seeing, hearing, smelling, tasting and touching. Since then whenever information was supposed to reach us mysteriously it was spoken of as arriving through a sixth sense, and later through a seventh sense. But we no longer count our sensations on the fingers of one hand, or even of both hands. Sensory qualities are now numbered in the tens of thousands, while the groups which we dis-

cuss are still made up more or less on the basis of these traditional "senses." The large divisions of sensory experience now number seven, as the following table indicates. The order of the sensory divisions in the table is not important.

I. Visual (35,000) [1]
   1. Hues (150)
   2. Tints (1000)
   3. Saturations (?)

II. Auditory
   1. Tones (11,000)
   2. Noises

III. Gustatory
   1. Salty
   2. Sweet
   3. Sour
   4. Bitter

IV. Olfactory
   1. Fragrant
   2. Ethereal
   3. Putrid
   4. Spicy
   5. Resinous
   6. Burnt

V. Cutaneous
   1. Contact
   2. Pain
   3. Warmth
   4. Cold

VI. Kinæsthetic
   1. Muscular ache
   2. Tendinous strain
   3. Articular friction

VII. Organic
   1. Thoracic
      a. Chest-breathing
      b. Heart-beat
   2. Abdominal
      a. Diaphragmatic
      b. Digestive
      c. Excretory
      d. Sexual

12. THE NATURE OF SENSATION

In the mature mind a pure experience of the elementary type of sensation rarely if ever exists. A sensation in its analytic form is not found in

[1] It is to be noted that the numerical counts are only approximate. They refer to the average number of discriminable qualities in each instance.

the everyday life of human adults. It is one of those abstractions which every science makes as a necessary step toward correct thinking within that field. Physiologists have recently taken pains to point out that the simple reflex, which is the unit of mechanical performance of the body from the neurological aspect and the single cell which is the structural unit of the body as a whole, do not exist in or for themselves. A simple reflex acts quite differently, when it is surrounded by other reflexes, from the way in which it is technically supposed to act in isolation. In the same way the cell behaves differently in the presence of surrounding cells from its behavior when it is singled out for microscopic study. Many careful writers have similarly pointed out the abstract nature of a sensation.

We can approach this concept best by doing a bit of analysis of our own experience. Suppose someone should sound middle C on the piano keyboard. That would result in a complex experience which must be further reduced to fundamental terms. It is necessary to abstract, at the outset, all reference to melodies or refrains that start with this note, if such are suggested. It is then necessary to cancel the meaning of "piano tone." Still further, this note is a complex note and a skillful observer can detect in it many so-called partial tones. As many as fifteen have been heard

by the human ear. But even if we should take a very pure tone of the same pitch it would be our persistent tendency to read a meaning into that note, to assign it to some physical object which is producing it, or in some way to obtain a complex experience. This is not what the scientist does when he analyzes events into their simplest forms.

When we indicate as we have done in the table above that there are approximately 11,000 tones we do not mean that anyone has heard 11,000 different tones on any one instrument or on any number of instruments. As a matter of fact, music uses roughly only one hundred different notes. It is, therefore, not a note that is designated by a tonal quality. In determining this number experimentally the observer is first tested for the lowest pure tone that he can hear and then for the highest tone. In both cases noises can be heard beyond the limits of tonal hearing. For the range of tones between these limits it is necessary to take instruments which emit pure tones and whose tones are variable and find out by this means the just noticeable difference (j.n.d.) that can be detected in all regions of the tonal scale. Wherever a count of this sort has been checked over we can estimate the number of qualities which the average person can experience. This sensory quality establishes the unit of measurement and is for the modern

psychologist the equivalent of the traditional "sensation." Each single tone among these 11,000 is a distinct sensational quality.

13. VISUAL SENSATIONS

In a brief treatment of the subject, such as the present, it is not possible to collect all the facts concerning each one of the sensory groups. Since experimental psychology began with a description of the sensory departments, a great mass of material has accumulated under each one of the seven divisions given in the classification. Most is known about the visual group of sensations, since in man both vision and audition have been of the utmost significance in our adjustment to the environment. Writers on the subject usually agree that there are three kinds of visual sensations. First of all, there is the series of grays or *tints,* ranging from the deepest black, as experienced when on a cloudy night the electric lights suddenly go out everywhere, to the whitest white as seen when one passes from a fairly dark room out into a street covered with freshly fallen snow dazzling in the sunshine. All intermediate grays lie on a straight line between these extremes, and, as we have indicated in the classification about 1,000 are visible to the normal eye.

Besides these tints there are about 150 pure colors technically known as *hues.* Our arrangement

of these is in a square with the purest reds, yellows, greens and blues, which are known as primary colors, on the corners of the square. The intermediate colors, like the orange, fall between the reds and yellows and the olives between the yellows and the greens and so around the square. It should be noted (1) that no infra-reds or ultra-violets appear in our scheme because these never have been experienced—they are calculated by means of physical instruments; (2) that one may start at any point in the square and come back to that point without any gaps; (3) that the colors are not crowded in any one point as they are in the rainbow or the physical spectrum whose unit is the length of the light wave rather than the number of visual experiences that occur between any two points.

Then there are *saturations* which are differences in the depth of the color itself. Some reds are more saturated though not lighter or darker than others. We might take, for example, some bright red water-color of medium tint and dilute it in a glass bottle, being careful to put a neutral gray background behind the glass of diluted pigment to prevent a change in tint. The red color will fade but it will not become lighter or darker in tint. These three visual qualities are assembled in what is known as a double pyramid whose middle belt is composed of the pure colors or *hues,* whose cen-

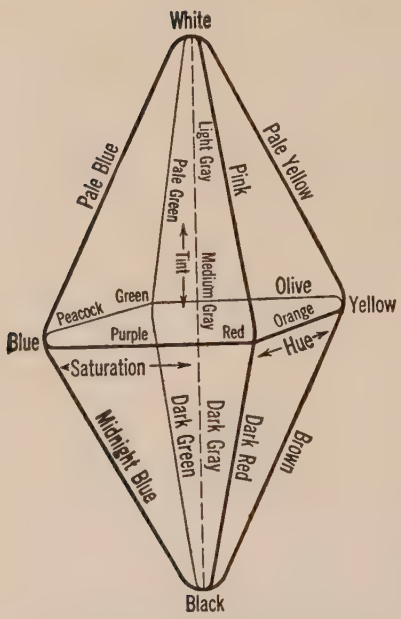

FIG. 2. THE VISUAL HECTOHEDRON

The visual hectohedron, or double pyramid, has generally been accepted as a satisfactory scheme for showing how visual sensations are related to each other. If we start from the colorless (achromatic) sensations they will be found to lie along a single straight line from the whitest white to the deepest black with medium gray at the center. This line forms the vertical axis of the figure outlined and along this axis changes of tint are to be found. All of the colors can be arranged in a continuous band with critical turning points for the primary colors, red, yellow, green, blue. There is no gap in this spectrum because what can not be experienced is not represented in psychology. Along this band forming the equator of our diagram are found all changes of hue as indicated by the arrows. The colors here are at their maximal value. The distance in and out from the axis of the diagram and at right angles to it indicates change of saturation. A given blue remains true to color but becomes less saturated as it passes toward the grays. Every color of maximal value becomes at once lighter and less saturated as it passes to white, and darker and less saturated as it passes to black. Pale yellow would be not only light yellow but less saturated yellow. The corners are rounded because in passing to white or black the change becomes quite abrupt toward the end.

tral vertical axis is the *tint* line from white at the top to black at the bottom and whose distances from the axis at right angles to it from any point indicate the qualities of *saturation.* (*See* Fig. 2.)

14. AUDITORY SENSATIONS

Sensations of sound are usually divided into those of tone and of noise. Most tones heard in everyday life are complex, made up of a whole series of tones bearing a very simple mathematical relationship to each other. In fact, the quality of musical instruments rests primarily on a difference in the constituency of the complex tones they produce. With relatively pure tones it is found that the lowest tone which can be heard is equal to about sixteen complete vibrations per second, while the highest tone reaches about 25,000 vibrations per second. Musical instruments as a rule do not have this range but begin with about 20 vibrations and extend to 4000.[2] Of course our musical scale takes the semi-tone as its basis and any performer on the violin or slide-trombone knows that variations can be produced and detected that are much finer than a semi-tone. Some observers have heard as fine a tone as a fifth of a single vibration in the middle range, but the average sensitivity is

[2] The 88-note grand piano extends from 27.19 d.v. (A) to 4138.44 d.v. (C_7) while the organ may comprise nine octaves from 16.17 (C) to 8276.88 (C_9) in the international pitch system.

Note on Fig. 3.

The most plausible diagram that has yet appeared in connection with the auditory qualities is the spiral, first proposed by Drobisch in 1855. Like Helmholtz's theory of hearing, this, with slight modifications, seems to have stood the test of time.

The author's own modifications of it are somewhat as follows: For the first two octaves, the circumference of the spiral is relatively large to indicate a relatively high degree of "volume," or what Titchener calls "diffusion," but the ascent of the spiral is slow to show the relatively few discriminable qualities within each octave. From there on, the circumference becomes somewhat smaller and the successive turns of the spiral are spread farther apart to show, first, the relative decrease in "volume" or "diffusion," and secondly, the relatively greater number of discriminable qualities in the treble region. Towards the end the spiral comes more or less to a point to mark the great decrease in "diffusion," or "volume," or "pitch-brightness."

Many studies have pointed out the fact that in addition to a continuous change in pitch, there is a periodic similarity in the "quality" of certain tones. This has led some writers to refer to the pitch line as a line of "ordinal" values, whereas the successive octaves have been called "cardinal" values. Those persons who have absolute pitch consciousness or the ability immediately to name the pitch that they hear, either in music or in everyday life, frequently remark that they can more easily tell the "*a*-ness" or "*c*-ness" of a note before they can locate that *a* or *c* in its proper octave. Stumpf in his discussion of primitive music makes the octave relationship, as well as the fifth, fourth, and third, of primary importance in the development of early music. This is represented on the diagram by the vertical sequence of all octave relationships and by the diagonal position of other related musical intervals as shown in the diagram.

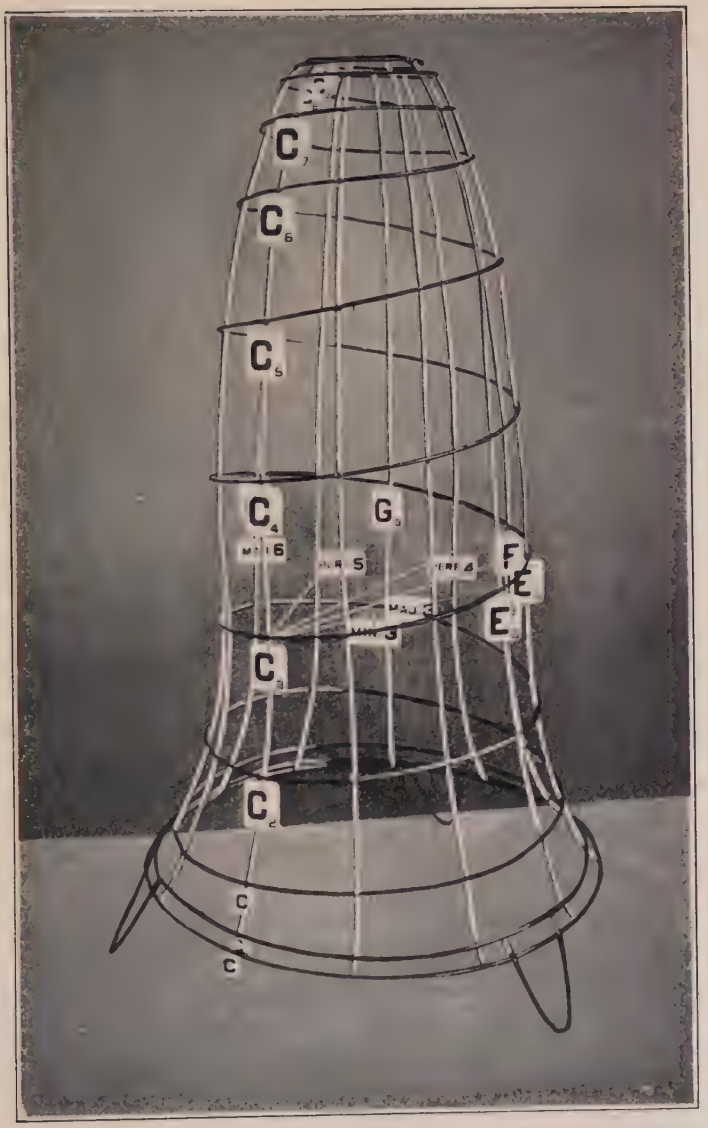

Fig. 3. The Tonal Bell

about a single vibration in this region. Other qualities have been discussed besides pitch in the tonal region but there is no agreement as yet in this matter. Some have discussed *vowel quality* but it has been recently shown that this is not a *quality* but an *interpretation* of quality or *meaning*.

Noises are usually classified into two large groups,—explosive and continuative. Approximate pitch qualities have been determined within each one of these groups. In order of pitch the two classes would be illustrated by a thud, crack, crash and snap for the former type of noise, and by a roar, roll, rattle and hiss for the latter. Many musical instruments really produce noise qualities as in the xylophone and the kettle-drum, but these instruments can also be tuned roughly in pitch. With resonators attached the xylophone is transformed into an instrument that gives a very fine pitch quality in the marimbaphone. It is thus apparent that there is no exact boundary between noises and tones.

15. GUSTATORY SENSATIONS

The qualities of taste are startling in their simplicity because in everyday life the substances which we taste give us cues that are not, strictly speaking, gustatory qualities. Many of them entirely lack the gustatory quality and are largely dependent for their effects on the odors that are

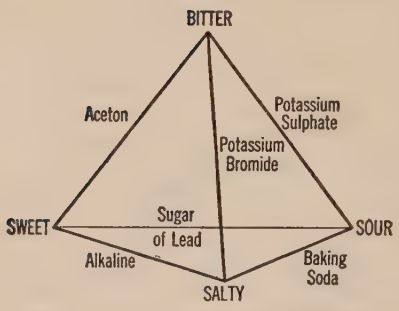

FIG. 4. THE TASTE TETRAHEDRON

The taste tetrahedron is an attempt by Henning to show the interrelations of taste. The four corners are marked with the principal taste qualities and the intermediate lines show substances which give tastes that are related to the opposite corners. Henning very definitely states, however, that these intermediate tastes are not combinations of the "corner" tastes but can be referred to them in the same way that an orange color can be referred to yellow and to red. He thinks that the intermediate tastes are more like one another than they are like their respective corners.

emitted even while in the mouth, through the posterior nasal passages. Besides these smell qualities which are added to taste proper there are cutaneous effects, since the tongue and sides of the mouth are sensitive to warmth and cold and to various kinds of pressure. When the whole story is told, of course, there are many degrees and combinations of taste qualities so that one substance can be distinguished from another by the combined experience itself. That is why some things are more agreeable to our "taste" when they are heated. Cold mashed potatoes, before they are mixed with saliva and before the starch is thereby reduced to sugar, practically have no taste aside from slight saltiness. It is a very common experi-

ment in our laboratory with elementary students for the experimenter to plug the nose and then present weak solutions of coffee and tea, which may then not be distinguished by the observer from each other. Both are bitter and good coffee differs from bad coffee chiefly in the aroma and not in the taste. And so aside from the cutaneous and olfactory qualities which are usually added, psychologists have reduced the complex tastes of everyday life to four taste qualities proper. These are arranged in what is known as the taste tetrahedron or a four-faced triangular prism. The four qualities would then appear at the corners with substances whose taste qualities are intermediate lying along the lines as shown in the diagram (*see* Fig. 4). The four principal taste qualities are sweet, salty, sour, and bitter.

16. OLFACTORY SENSATIONS

There has been a considerable amount of discussion of the smell qualities and a thorough-going revision by Henning has recently given us a new classification in terms of a three-sided rectangular prism with triangular ends (*see* Fig. 5). Fragrant, ethereal and putrid odors are names for primary qualities that appear at one end of the prism. At the opposite end at corners analogous to those just mentioned appear spicy, resinous and burnt. Many other qualities are given positions on the

surfaces of the prism but can always be referred to several of these primary odors. Like the taste

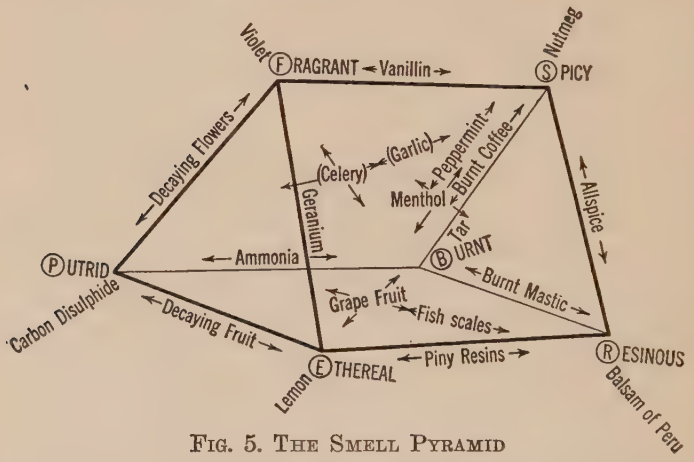

FIG. 5. THE SMELL PYRAMID

While there is still considerable controversy over the allocation of the various odorous substances indicated, Henning has made notable progress in the classification of the smell qualities. Some olfactory qualities have a simple reference, like lemon, tar, violet, etc. They appear at the corners, and are known as simplex. The duplex odors lie midway between the corners or diagonally across the faces and are indicated above by double arrows. There are no triplex odors. The quadruplex odors, like grapefruit, celery, and menthol, are referred to the four neighboring primary odors and lie on the quadrangles. There are no qualities indicated within the pyramid—only the surfaces are used for the classification. (The names placed in parentheses indicate odors on the rear face of the prism.)

tetrahedron, but unlike the color pyramid, no qualities appear within the prism. This arrangement is the result of exhaustive study of over four

hundred separate samples gathered in all sorts of places from the perfumer's shop to the menagerie. The experiments have been repeated by careful investigators and by naïve observers and so far have fairly well stood the test of further study.

17. CUTANEOUS SENSATIONS

The outward membranes of the body as well as the mucous membranes at various openings of the body and to some extent within the body are sensitive to stimuli and give rise to four different groups of sensory qualities. These are found scattered at definite points over the area of the skin. The skin is consequently no longer conceived as being uniformly sensitive. In fact, there are places in many regions of the body where no sensations occur at all and there are other places whose general sensitivity is peculiarly limited to one quality. This classification includes the touch sensation proper which is now called contact, pain sensations, and sensations of warmth and of cold. Pain sensations are the most numerous, while contact is about as extensive as cold, and warmth is stimulated in many fewer spots. The entire body has been very carefully investigated both in the interests of pure science and for the purpose of diagnosing pathological cases. It is to be noted that pain is not used in the same sense as the older books used

it; namely, as designating discomfort or unpleasant qualities. Pain and unpleasantness are now differentiated because it is known that under certain circumstances a pain sensation (as when one gives an aching tooth an extra jab with the tongue) may not always be unpleasant. Head, an English physiologist, has suggested that there are really two separate mechanisms involved in mediating

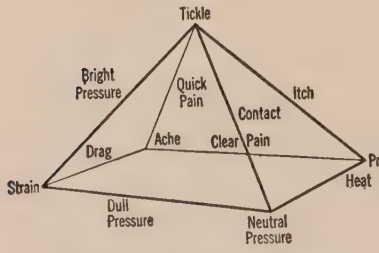

FIG. 6. THE TOUCH PYRAMID

This is an attempt to systematize the cutaneous and subcutaneous qualities in relationships that have been indicated in a number of experimental observations. No definite place has yet been found for warmth and cold and some recent work on heat suggests some rearrangement of the principal qualities. The scheme is copied from Titchener with slight modifications. It is offered as a tentative arrangement showing the present state of our knowledge in a field that requires more experimental data.

cutaneous sensations: the protopathic, older and usually more deeply lying, although exposed at certain limited areas, and the epicritic or more recent and sensitive. The former conveys pressure, pain and heat and cold of marked intensity: The latter gives contact and warmth and cold of mild intensity. Some American investigators, however, have failed to obtain the same results. Titchener has given us a useful diagram (Fig. 6)

for visualizing some of the relationships that have been discovered among various sensory qualities in this group. Some of these are still considered by other authorities complex in nature.

18. KINÆSTHETIC SENSATIONS

By thorough-going experiments it has been found that the individual specifically experiences movements either of the body as a whole or of various parts of the body. Sometimes facts of this sort are emphasized in pathological cases because in everyday life we are chiefly concerned with the objects that pass in review outside of us. But cases have been reported of patients who were able to walk but unless they looked at their feet they did not know that they had walked. Of course in such cases not only the kinæsthetic sensations which come from the muscles, tendons and joints, but probably the cutaneous sensations were also absent. A neat analysis of these sensations can be made if one should tightly clench the fist and experience first of all the cutaneous sensations of fingers digging into the flesh. The prominent thing, however, would be a muscular ache in the muscles of the forearm, the tendinous pull or strain of the wrist and the feeling of articular friction at the joints in the knuckles. These three qualities are each different in character and in localization. Often after a long stroll one feels gen-

eral muscular fatigue in most of the muscles of the body but without the painfulness of extreme aches.

19. ORGANIC SENSATIONS

It has long been known that sensations occur within the confines of the body in addition to those discussed above. The Greeks were in the habit of locating their minds in various regions of the thorax and abdomen because they felt disturbed when moved by strong emotions. Obviously this field does not lend itself very easily to investigation, although several self-sacrificing experiments have been reported from various laboratories. The results of these studies seem to show that the sensations included in the classification do not present any new qualities, but simply new localizations of qualities already described. They are much like the muscular pressures and some of the cutaneous effects that we have classified in previous sections.

20. DESCRIPTION OF SENSORY END-ORGANS

It is difficult in a brief account like this to give adequate descriptions of our sensory equipment. Were it not for the need of explanation of our sensory experience we would not attempt it at all. The interested reader is urged to consult the more extensive texts which are listed at the end of the previous chapter. The eye can be considered a sort

of camera with a sensitive film in the back of the eyeball called the retina. Rays of light pass through the several media of the eye, and are focused by the lens at a point of clearest vision directly opposite the lens, called the fovea. Here the nerve strands which cover the rest of the retina bend aside and expose the end organs of sight which are conelike structures for daylight vision and rodlike structures over other parts of the eye for night vision. There are no rods at the fovea but rods and cones cover the rest of the retina, save for a blind spot where the optic nerve enters the eyeball on the nasal side. It is supposed by the most widely accepted theory, which is a modification of the Hering theory, that in the rods and cones there are three reversible chemical processes, corresponding to the black-white, red-green, and blue-yellow qualities; that red, yellow and white are destructive energies and the others are up-building in their effect. Through the mutual effects of these substances vision occurs. Ladd-Franklin further supposes the black-white substance to be the oldest in the genetic development of the eye, that the blue-yellow substance developed from this original substance, and that the red-green substance arose out of the yellow component.

The ear is even more difficult to describe because

the essential organ of hearing is a very complicated mechanism within the inner ear, called the cochlea, in which on a projection of a spiral shelf are found the little hair-cells that contain the end fibers of the auditory nerve. Many theories of hearing have been proposed but the Helmholtz theory of sympathetic resonance, slightly modified, seems the most plausible. It supposes that the spiral shelf is connected with the outer wall of the cochlea by means of some 20,000 fibers, groups of which are tuned to receive each one of the 11,000 tones heard. They then agitate the hair cells whose hairs are stimulated by the tectorial membrane floating above them and these cells then convey the stimulation through the branches of the auditory nerve.

The end organs of taste are small taste-buds which occur on the sides of pimply structures visible on the surface of the tongue, known as papillæ. It is exceedingly difficult to get at the taste-buds individually. Most papillæ respond to several sensory qualities, although it is known that the tip of the tongue is most sensitive to sweet and salty, the back of the tongue to bitter, and the sides of the tongue to sour and salty. There is a region in the middle of the tongue that is apparently insensitive to taste qualities.

The olfactory sense organs are still harder to

reach since they lie at the top of the nasal passage just under the brain. There is a yellow patch which apparently is sensitive to chemical stimulation but it is not certain whether that chemical stimulation must be in gaseous or liquid form.

The cutaneous end-organs are not fully established. Here the physiologists are somewhat at a loss to give psychologists the necessary facts for our explanation. The cutaneous pressures are mediated by nerve endings which cluster about the roots of the hairs in the hairy portions of the skin, but in the hairless portion, such as the palm of the hand, there are bodies known as the Meissner corpuscles. For cold and warmth nothing is certain. The best theory is that the end-bulb of Krause corresponds to cold and the end-organ of Ruffini corresponds to warmth, but this has recently been disputed. No pain organ of any sort has been made out and some believe that free nerve endings are responsible for this sensation, as well as for many of the other cutaneous qualities. In regard to the kinæsthetic and organic classifications we know still less about the actual sense organs. We learn from pathological cases and surgical operations that the various tissues are sensitive but very few definite organs have been found to correspond to stimulation in these regions.

21. SUMMARY

We have tried to show the importance of sensory experience in forming the foundation of our mental life. The analysis has driven us away from the five-fold classification which was traditional to a classification based upon seven divisions of sensory experience. The sensory qualities which are now the irreducible elements number in the tens of thousands and have been described in detail under various sections. We have also tried to describe the sense organs of the body, in order to account for the types of stimulation which translated give us the groundwork for all of our mental processes and our complex experience.

REVIEW QUESTIONS

1. (*a*) What *sensations* are you experiencing as you are holding the book and reading this sentence?
   (*b*) Are these *sensations* at first or more complex processes? Explain.
2. (*a*) Is pink a different *hue* from red? What is the *tint* of tan as compared with that of brown?
   (*b*) Criticize in detail the statement: "We can hear approximately 11,000 musical notes."
3. (*a*) Enumerate all the different sensations that are experienced in eating vegetable soup.
   (*b*) On the Henning smell prism find the best location for the odor of gasoline, of camphor, and of evergreen trees.
4. (*a*) At what two places is the eye totally blind at night or under very much reduced illumination?

(*b*) In what two ways may pressure sensations be started on their way through the nervous system?

5. (*a*) Locate all of the sensations felt after having eaten a "heavy" meal or food that does not "agree."

(*b*) Describe the *quality* of each one of these sensations.

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CHAPTER IV

RELATED ASPECTS OF SENSORY EXPERIENCE

> "I had seen moonlight and daylight together before, but I had not seen daylight and black night elbow to elbow before. At least I had not seen the daylight resting upon an object sufficiently close at hand, before, to make the contrast startling and at war with nature."
>
> —Mark Twain, "A Tramp Abroad."

22. ADAPTATION

We are now acquainted with the various qualities of sensory experience and are ready to discuss some of the more important changes in these qualities that follow experimentally discovered laws. We have so far described the sensory qualities in all of their possible variations. We have now to give an account of the behavior of these qualities in the presence of each other, of their modification with time, and of the degrees in which they may be experienced. One of the most frequently observed modifications of experience with the passage of time is called *adaptation.* It is to be distinguished from fatigue which has its own bodily symptoms and is known by its own peculiar qual-

ity. It must be further distinguished from the experience of becoming familiar with, or accustomed to, objects after their novelty has worn off. You might say that you become increasingly familiar with the Bible or with one of Shakespeare's plays as you grow older. Adaptation on the other hand denotes a difference in the experience of the original quality during continuous stimulation. Physiologically the problem means that the sense organ will not continue to respond to the stimulus in the same manner as it did at the beginning of the period of stimulation. Its response is gradually changed with constant arousal. A characteristic example of this phenomenon will probably make the abstract description clearer. Adaptation is principally found among visual, olfactory, gustatory, and cutaneous sensations.

All of us have probably noticed after reading under the yellow illumination of a kerosene or candle flame for some time that its yellowness is no longer as vivid as it was in the beginning. Some of us have worn colored eye-glasses either in automobile travel or on a trip across the water or snow and have been struck with the prominence of the color at first, but we have been even more surprised by the gradual disappearance of that color after we continue to wear the glasses. The photographer in the dark-room under a reddish light notices the same effects. His photographic

plates and papers no longer seem different degrees of red but of gray. This experience is also reported by postal employees and others who work under bluish light and is commonly found in many visual experiences. The worst thing for example that a dressmaker can do when she is matching a ribbon to some cloth fabric is to stare at both colored materials continuously. Any slight differences that were present at first will tend to disappear with time. It has been experimentally proved that this occurrence is entirely one of sensory experience and not affiliated with changes of attention. We simply fail to sense the same values with which we started out. The facts of visual adaptation, then are chiefly these two: (1) that *with continued stimulation during a given period all hues tend to become less saturated,* (2) and that *under similar conditions all tints tend to become equivalent to medium gray.* The double color pyramid thus tends gradually to contract towards a point around its center. It has been found that complete visual adaptation in the average human individual takes about 45 minutes and for careful experimental work in vision it is customary to state at what stage of adaptation the observer experienced his results.

The same phenomena have been noticed in the qualities of olfactory sensation. The housewife whose potatoes are beginning gradually to burn

on the stove becomes adapted to the particular odor so that she often fails to notice the damage. But an outsider coming near the kitchen very definitely smells this odor at once. Should he remain, however, he also would become less and less affected. Some of us often wonder why people can work under such obnoxious conditions as many laboring men have to bear or why some people live in such uncomfortably hot houses. The answer is the same. We unreflectively say that they gradually "get used" to the odor and to the heat. We ought to say that their senses report them less and less faithfully. In going to an exhibition of flowers the most startling impression is made as you first enter but you soon become adapted even to these fragrant odors unless, indeed, new types of fragrance are presented by every new group of flowers. Anyone who has a chemist among his acquaintances has probably heard the same story about unpleasant odors. The tendencies of adaptation in olfactory sensation have not been so thoroughly investigated as they have in vision; although the *method of exhaustion,* as it is called, has been until recent times one of the chief means of confirming certain classifications of smell qualities. A good illustration of it is the continuous smelling of camphor through a tube until the odor has disappeared. Then other odors are sampled in rapid succession immediately after. Oil of juniper

would then be sensed weakly, alcohol not at all, while musk would be as strong as ever.

Among the gustatory sensations some attempt has been made to find out the relations between the four qualities in terms of their relative degrees of adaptation. It is known in a general way that not only is a continuous use of sweetmeats sickening but there is failure to sense the sweetness of the candy after a time. The same is true to some extent of other qualities like bitter and sour, and even salty. It is the part of culinary art to know just at what time during the meal to introduce the proper flavors. Of course flavors, strictly speaking, are often more odors than tastes.

And finally it is found to some degree among cutaneous sensations. If a certain region of the skin be isolated, more especially if a single spot on the skin be selected, a continuous application of some stimulus to that particular spot will result in a gradual cessation of function. Our students in the laboratory frequently notice that a cold spot touched even the second time does not feel like the same kind of cold. We all know in a general way how the exposed parts of our bodies become adapted to temperature. Someone asked an Indian visitor to a Canadian winter sports exhibition why he didn't cover his naked limbs and he replied, "Does the white man cover his face," Not only in cold sensation but in contact and pain

the same phenomenon occurs. Of course as soon as the prolonged stimulus begins to affect the structure of the tissues themselves more deep-seated pain or other sensations will result.

23. CONTRAST

Closely allied with adaptation and usually explained by the same theory is a heightening of effect due to the presence either at the same time or in rapid succession of other qualities. The first type is known as simultaneous contrast. The second, as when the eye rapidly covers one field and then passes to another, is called successive contrast. We all know how a simple black frame enhances a steel engraving. We know further what certain colors have their effects increased by the colors upon which they lie. Too vivid a red worn near the face has a tendency to give the complexion a greenish effect. On the other hand, a very ruddy complexion itself changes the æsthetic value of hair and garments seen nearby. The effect wears off with the distance that the two visual qualities are separated on a common surface as will be seen when one steadily fixates the line separating the black frame from the white background. Along that line the paper is whiter and the frame blacker than over the rest of the region. Something of this effect is artificially produced

in a form of portrait photography in which an outline of intense light is made to appear around the hair or profile. This accentuates the details in addition to the production of the artistic effect. In a similar way, through color contrast, gray ribbon worn on colored goods will very often take on the color opposite from that of the goods. These are in general known as *complementary* colors. Red is complementary to green, blue to yellow, orange to peacock and purple to olive. In other words, complementary colors are found by tracing a line from one color to another through the center of the pyramid.

Contrast occurs also in other sense departments but on the other hand definite laws have not yet been fully established for these effects. Contrasts are perhaps equally noticeable in taste. Chocolate drunk at breakfast soon after orange juice is much sweeter than without the previous sour taste. In the same way sweet cookies eaten with lemonade have a decidedly sweeter taste than normally. What was said before in connection with adaptation in taste holds true now of contrast and a degree of expertness can also be obtained in arranging the menu to its best advantage in the light of the laws of contrast. More than that, some tastes which are made too weak to be sensed at all, like sweet, become sensed when a contrasting taste, like salty, is applied at the same time.

24. AFTER-IMAGE

After-images occur principally in visual sensations. Several psychologists are urging that they be called "after-sensations." They are of two kinds,—positive and negative. The positive image has been shown to occur after the actual stimulation is removed and lasts for a small fraction of a second depending somewhat on the amount of previous stimulation. It is this positive after-image which enables us to see a "moving" picture without flicker. For, as is well known, the picture on the screen does not move. We see simply a series of rapid exposures cut off from each other by a shutter which excludes the light while the film is jerking into its next position. This shutting off of the light is not noticed because the previous sensation continues and ties itself to the next one. At a distance the same thing occurs in illuminated advertising signs which show their effects through outlining several positions in the desired movement of light. Millions of dollars are spent in our larger cities to get these results. The positive after-image can not otherwise be very easily demonstrated because the time when the stimulus stops has to be made known to the observer for him to realize that he is no longer being stimulated from without. The after-image of the positive type occurs probably in other sense depart-

ments also, especially in the cutaneous group where a crawling sensation can be produced by a series of step-wise stimulations. But recent investigations have indicated that it does not occur in hearing.

The negative after-image, however, is generally much more easily noticed, but it is only clearly found in vision. Many of us have seen a beautiful sunset over the mountains or across the water and then have turned away still seeing a disk representing this sun outlined in the opposite color, usually green. This is why the image is called negative. The color seen is always complementary to the original stimulation and is favored by a long stimulation of from 30 to 45 seconds. It may then appear periodically for some time, and generally only after a brief interval following actual stimulation.

25. FUSION

Not only are the sensations subject to changes due to the continuous presence of each other but sometimes they blend and thereby, temporarily at least, lose their qualitative identity. Furthermore, in the case of vision the resultant mixtures completely hide their original components. No one looking at a gray effect obtained by the fast rotation of several colored papers on an electric color-mixer could tell what colors made the mixture.

In that case we have mixed the stimuli, not the sensations, to produce these results and the result is not therefore a fusion. For this reason it is doubtful practice to discuss the so-called laws of color mixture in psychology because the laws show only the experienced effect produced by mixing certain ingredients on the physical side.

Other sensations blend either in their own sense departments as, for instance, when we have tones producing a consonance or harmonious result, or when tastes or smells are blended to produce combined effects, but in most of these cases the original components can still be detected. One exception occurs in connection with the taste of flatness produced by weak salty and sweet. Although more work needs to be done on this problem perhaps some of the olfactory blends are related to the primary odors as instances of fusion. In the cutaneous field much recent work has been done on combinations producing the effect of wetness, smoothness, roughness, stickiness, and clamminess. The proportionate amounts of simple sensations that make up these complex experiences are in many cases not sufficient to produce the desired effect, but especially in clamminess a certain mental attitude has to be suggested before the experience is felt. Most of us know, however, that a very smooth cool coin might very easily be misinterpreted as wet.

26. JUST NOTICEABLE DIFFERENCES

One of the best ways in which we can investigate an individual's equipment for many occupations and professions is to test his keenness in detecting just noticeable sensory differences. These differences are usually on the quantitative side, but may be qualitative also. For instance, in sound it is worth while often to find out just how small a quantity of sound can be detected. The result gives us the *auditory acuity* of the individual. But it is also important to find what is known as the pitch discrimination in every case. To get these values one must test a large number of individuals of given age, sex and general training and see how each individual compares with the average or standard. But not only for this purpose but for the systematic treatment of mental facts one must know exactly how many sensory qualities in general there are. Thus refined methods have been devised for giving these results. The number of sensory qualities which we have indicated before in connection with the qualitative classification have been derived from such investigations. Some interesting results have been obtained within certain limits for values which shall be just noticeable while the individual is already under stimulation. For instance, when an observer is being stimulated by light he will not notice an increase in the

amount until about 1/100th of the present amount is added. Investigations point to a much larger increment for pressure (1/20) and one still larger for tonal sensations (1/6). In taste, smell, warmth and cold, these fractional increments have not been yet definitely determined but they are probably somewhat larger than any of the others. Facts of this type are gathered together in a mathematical formula known as *Weber's Law.*[1] Of course it follows conversely from this that under favorable conditions, or unfavorable as the case may be, variations in intensity may be made so small that they may not be noticed at all. Similar investigations are concerned with the amount of stimulus that can just be noticed as a distinct sensation. For instance, the number of vibrations which will first produce a smooth, even tone, as well as the highest number of vibrations that produce a tonal effect are matters determined under this rubric. From such studies we obtain the facts outlined above when we discussed the lowest and

[1] Weber's Law may be concisely stated in the following words: In a given sensory quality, *relatively* equal differences in physical units of intensity are sensed as mentally equal.

Fechner later gave this the mathematical formula S= C log R; which means that a given, just noticeable difference in the intensity of a sensory quality (S) is found to be equivalent to a constant factor (C) multiplied by the logarithm of the stimulus (R) as measured by physical units of intensity. Concisely stated we may say that the sensory values follow an arithmetical series while the physical series follows a geometrical series. The fractional values given above represent, then, the experimentally determined constant factor (C).

highest audible tone, the number of tonal sensations, and other similar mental phenomena.

27. QUANTITATIVE ATTRIBUTES

Throughout we have discussed several changes in the qualitative aspect of sensations without classifying the attributes which can generally be used to describe sensations from the aspect of degree or of amount, *i.e.,* their quantitative values. Authorities differ in general about the complete list of quantitative attributes, but most of them agree that there are at least two,—duration or *protensity,* or the lasting and continuing character of sensations, and *intensity,* or the strength and weakness of sensory experience. Legato and staccato playing in music mainly afford variations in the duration of the tones sensed; whereas loud (fortissimo) and soft (pianissimo) effects and all intermediate variations give rise to sensed differences of intensity. There is some discussion about a third quantitative characteristic, that of extension. Some psychologists claim that all sensations are extended or spread over an area, some others assign it only to some sensations, like the visual, cutaneous and kinæsthetic, and deny it to all other sensations, while a recent writer claims that this is not a matter of immediate attribute of sensation but of logical inference or meaning in the complex perception. The most disputed quantitative attri-

bute is clearness or *attensity,* that is, the degree of attention given to a sensory experience regardless of other attributes. A whisper heard in a drawing room may become clearer to the listener than the general drone of voices which are in themselves much louder. Consequently some writers hold that there is a variation in clearness or attensity independent of intensity. The problem of these last two attributes, however, is still unsolved and it is difficult to treat of the matter specifically here. For our purposes we can be fairly sure that there are at least two quantitative attributes, in terms of which every sensation must be described as well as from its qualitative side, and that they are (1) *duration* or *protensity,* which is indicated by the term, *process,* in place of the previously used term, *state,* and (2) *intensity* which denotes the relative strength of the process.

28. INDIVIDUAL DIFFERENCES

If this were a book on differential psychology which had as its aim the description of different minds, we should have to elaborate at this point in very great detail. It is sufficient just now to realize that the classifications and descriptions which we have made are the occurrences of the normal experiences in the average individual. There are, of course, great differences in pitch discrimination, in the sensitivity to color and to

other sensory experiences. It is being claimed, for example, that among the feeble-minded certain anomalies occur with an increased frequency,—for instance, a relatively low sensitivity to pain. One of the most interesting and much discussed subjects is that of color-blindness which may occur in several forms. First of all, for instance, we may have total color-blindness in which the colors may be named but incorrectly distinguished or distinguished only on the basis of their characteristic lightness and darkness. Partial color-blindness is reported as being present in about 2% of the male population and in less than 1% of the female population but subject to inheritance through the female, so that while it does not appear in the daughter of a given mother it may appear among male cousins on the maternal side. Partial color-blindness is almost always red-green color-blindness, which, according to the Ladd-Franklin theory of vision, corresponds to the last chemical substance to develop and therefore probably the first to disappear in abnormal vision.

29. SUMMARY

We have spent a considerable amount of time in discussing the sensory experiences both in their qualitative and quantitative aspects because they are the fundamentals in terms of which the higher mental processes are established. Individual dif-

ferences, as we have pointed out, occur and therefore color the type of mind that results from any variation in the constituents. We have shown from beginning to end that sensations have to be taken in relation to each other in order to obtain a complete description of sensory experience as a whole and that when this occurs adaptation, contrast, fusion, after-image and their related phenomena appear as problems for special investigation. But in all of these matters we can obtain our answers only under the carefully guarded conditions of experimental control and with standardized procedures. When illustrations have been used they have been mentioned only as examples of the facts in each case. For detailed investigation of the facts we are bound to go to the laboratory. After this preliminary ground-work is done we can proceed with the higher mental processes, which are then not only more easily understood but also more real, since they are closer to our everyday mental lives as we know them.

REVIEW QUESTIONS

1. How does the Hering theory of color explain the phenomena of (*a*) visual adaptation, (*b*) color-contrast, (*c*) color-blindness, (*d*) negative after-images?
2. From your own experience give an introspective account of temperature adaptation.
3. Show (*a*) some advantages and (*b*) some disadvantages of using red and green lights as important signals on railroads, boats, and airplanes instead of other colors.

4. (*a*) Without showing it to you in advance let some one else hold a plaid-colored piece of cloth at such a distance from you that you can not see the colors of the individual stripes. What is the general effect in terms of hue, tint, and saturation? How does this experience differ from that of the following arrangement?
   (*b*) Let some one play three or four notes—preferably making a musical chord on the piano. Can you also hear each individual note in the complex chord?
5. Describe an occurrence which clearly shows that the experience may have been weak in *intensity* yet strong in *clearness.*

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CHAPTER V

PERCEPTUAL EXPERIENCE

"More of it, probably, is due to his quick *energy* that sizes things up with marvelous speed and accuracy."
—J. A. Riis, "Theodore Roosevelt the Citizen."

30. MEANING

One of the outstanding problems in psychology today is that of meaning and the interpretation of the percept. We continually infer from the immediate sensory experience itself to the causes that lie behind it and the consequences which are to follow. A remark made by a friend is not heard as so many auditory sensations of varied pitch, intensity, and rhythm of expression but as a meaningful response on his part, the embodiment of an implied purpose which preceded the utterance in the mind of the speaker, and the forerunner of other ideas which are to be expressed thereafter. And all the while we may be wondering what the friend really meant. The flash of lightning again does not come as so much visual sensation of highly contrasting intensity and conforming to a zig-zag course through the sky but as a

foreboding of a storm that will soon reach us, or as a sign of the violence of the storm that is already about us and of the approach of possible danger. So from morn to night our experiences convey meanings; as laymen and men of the world we are not in general interested, however, in their analysis and synthesis, that is in their scientific character.

But it is one of the maxims of modern psychology that a simple or irreducible mental process can never *mean* anything. Meaning is based upon one or more of three factors. There are, first of all, inherited or instinctive tendencies, physiologically buried in our nervous system due to racial experience. Many mechanisms of response are perfected before birth. While most of the interpretations of emotional expression are slightly modifiable through experience the perception of fright in the widely distended eyes and open mouth of another person or the piercing shriek of distress are apparently immediately interpreted through hereditary tendencies. Even in many of the lower animals this instinctive interpretation of experience is found. Some years ago in another psychological laboratory where experiments were going on with white rats a fairly clear-cut instance of this was observed. These white rats had been bred for almost twenty generations in the laboratory and had never within that time been in the

presence of a cat. Suddenly one day we brought in a cat at the door, which was some 20 feet away, and at once the whole group of rats uttered the usual whine of distress. Since their eyes are not developed to the point of clear vision and can probably distinguish only light and shade at close range they must have relied entirely upon smell, which is their chief medium of experience. The criticism might be offered that these rats were in distress because of the novelty of the odor,—an experience which we can understand from the behavior of human as well as lower animal subjects when suddenly face to face with the unfamiliar. To test this assumption many other odors which were absolutely new were also introduced at other times but failed to elicit the characteristic response. As far as we can understand this behavior without any direct appeal to observation of the experience itself we must conclude that the response was never learned in the lifetime of any of the rats.

There are many experiences of similar types in human subjects so that when the organism is ripe for a particular instinctive response it is apt to read into experiences these inherited meanings. This seems especially true, as several psychologists have remarked, during the adolescent period when the organism is particularly keen in interpreting nuances of speech, facial expressions and

bodily postures in terms of inherited tendencies.

One of the classical examples of this type of meaning occurs in the pioneer work of William James in which he told of a personal experience when he was overcome during early childhood at the sight of a bucket of blood which a veterinarian had left in the street. The point is that James was too young to know at that time that it was blood. On the other hand Stratton has recently shown that bulls do not become infuriated at the sight of a red cloth or at the sight of blood. Apparently there are other circumstances surrounding the movement of the cloth or the retreat of the individual who is wearing the cloth that account for the attack on an instinctive basis. Be that as it may, certainly there are enough examples of the instinctive response to sanction this explanation.

Then there is a second type of meaning in which the interpretation comes in terms of previous individual experience. Perception of certain persons as for example, one's mother, from birth on has undergone much transformation. As almost everyone knows, the full meaning of "mother" does not begin to appear until later in life when one has perhaps assumed parental responsibilities. In the meantime the meaning becomes richer, even if the physical characteristics do not change very much. In the absence of the mother a portrait may suffice to show this effect as the years go on. One of the

largest producers of phonographs and phonographic records puts this concisely in the statement "A record never sounds the same no matter how often you play it. The record doesn't change but *you* do." And so the photograph of your friend or relative remains practically constant but you perceive in it more and more of the characteristics which you admire and respect. In mental terms this means that those remnants of previous experience which become latent in experience now color the experience itself. Our mental lives become ever and ever richer as our experiences in the world become fuller. And so a highly trained mind at a single glance can perceive the situation more adequately than the untrained and inexperienced. One of the remarkable characteristics of great minds is the rapidity with which they can interpret certain circumstances and events that enter their lives. And one of the reasons for a liberal education rests in the fact that having become acquainted with a vast variety of human achievements one's perceptions of everyday life are so much larger and interesting and one's sympathies are thereby extended. One of the lovable characteristics of old people who have cultured minds is the saneness and breadth with which they view the world. We speak of these conveyers of meaning as images that are tied to the sensations which are immediately received. These

images may be quite specific so that if you hear the voice of your friend in terms of sensations you also perceive at once his visual presence in terms of imagery, and perhaps the characteristic sound of his footstep. In the same way the opening words, "Oh, say, can you see" at once carry with them imaginal components corresponding to some of the rest of the phrase and indeed the accompanying melody.

In a third way we arrive at the meaning of experience through the associative trends that are in our minds at any given moment. If we should suddenly break off at this point and proceed to tell you about the great need for an international auxiliary language or the peculiar advantages of an eight-cylinder motor car, it would take you some minutes to realize what we are discussing. There is a sort of expectancy of meaning in terms of the ideas which are in our minds as we go along. Part of these ideas are involved in the suggestions that are aroused by a certain object whether it be a person or a physical thing, and some of the experiences which we all have had jar on us because in terms of these natural associations they are so incongruous. In the author's experience such a startling effect was once created when we celebrated in our own college day a great football victory by breaking into the college church and playing The Merry Widow Waltz on an organ

from which we usually heard only sacred music. So it is very often with people of whom we expect a certain demeanor and type of conduct. How we do love to see staid business men frolic at a picnic or how college students love to see their professors play baseball! James again very well

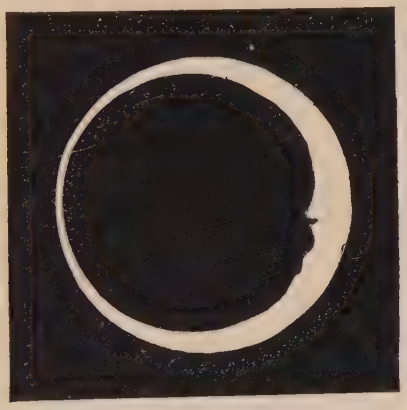

FIG. 7. WHAT OBJECT DO YOU SEE FIRST?

An example of visual perception involving a reversal of figure and background.

illustrated this kind of meaning with a phrase "pas de lieu Rhône que nous." In French this statement would have one meaning,—in English quite another. Visually this is illustrated by the diagram outlined in Figure 7 and recently used to show the interchanging background and form. When viewed with the black as background, we

see a crescent moon. When the white space is taken as background we see the face and head of an infant. Thereafter we switch back and forth with comparative ease. In other words, the third type of meaning is present mental context.

31. QUALITATIVE PERCEPTS

We speak of the percepts in the sense of a complex experience principally dependent upon elementary sensory processes and practically equivalent to the sensory experiences that are found in everyday life. These percepts are therefore always complex and analyzable into groups of sensations and a more or less indefinite haze of imagery which may clothe them with meaning. When such percepts are characterized mainly by a fusion of several qualities of sensations they are commonly called qualitative percepts. The "taste" of coffee which consists chiefly of the aroma, the bitter taste proper, and the warm tactual sensation, is such a percept. The blending together of partial tones into a clang or the combination of tones into a chord are other examples. Many of the cutaneous groupings are further instances of this effect, as has been recently shown in connection with the percept of wetness, or roughness, of stickiness and even some of the older complexes of coolness and of burn. Sometimes the distinction has been made between *complications* in which the group is homo-

geneous as far as the object is concerned but is represented in experience by qualities from several different sense departments and *fusions* in which the grouping is made in the same sense department. The taste of coffee would in general be an example of a complication whereas the percept of wetness would be more strictly a fusion. The distinction is no longer valuable.

32. SPATIAL PERCEPTS

By far the larger portion of work has been done on the subject of the percept of space, both of area, that is of two dimensions, and depth or distance, the third dimension. The spatial percept can occur only in those sense departments which admit of the attribute of extensity. According to many authorities these are the visual, cutaneous, and kinæsthetic sense-departments. We may localize other sensations in space but we do not perceive space directly in terms of them. It is shown by experimentation, for example, that we localize sounds mainly by indirectly noting differences in quality and intensity and possibly in the time of the arrival of the wave as these come separately to the two ears and by moving the head about until such differences are well marked. Smells are also given position in space and distance by relative differences in intensity. We have seen that visual and cutaneous sensations, and probably

kinæsthetic sensations as well, are always experienced in terms of spatial size. When we perceive this extent, as when we make an estimate of it, we have a clear percept of two dimensional space. But we learn also more or less efficiently to estimate distance. What happens more frequently and more involuntarily is the indirect percept of the third dimension or the thickness of objects facing us and seeming to us therefore as solid. Instead of looking out upon the world and perceiving it flat as in a photograph, we see it as a group of solid objects. This sort of spatial percept is called the stereoscopic percept and the instrument which enables us to see photographs or drawings in that manner is commonly known as the stereoscope. The main underlying principle is simple.

The most important factor in the stereoscopic percept is the fact that each eye, being trained on a given object of perception at an acute angle—an angle which grows more acute as the object comes nearer—receives a somewhat altered picture of that object. Even an amateur photographer knows that the view of a building depends upon the angle from which the picture is taken; moving from one street corner at a crossing to another materially changes the picture of the building. So it is with our eyes, save that our eyes are nearly always taking different pictures at the same time, —that is, we have binocular vision. The exception

occurs when the eyes are focused on the horizon of a far distant point. The disparity of the retinal images, as this is called, has occurred so long in the race, in those animals that have binocular or "two-eyed" vision, that the nervous system is already set for the interpretation of these as indicators of depth or distance. The same thing is true of the second factor that helps us to interpret distance: the amount of convergence of the two eyes when focused on an object. Not only are the pictures different but the adjustments of the muscles of the eye-ball to get this result are given to us in terms of amount of kinæsthesis. The greater the muscular pull is, the closer the object, as in the case of the near end of an approaching bridge. The more relaxed these muscles are, the farther off are the eyes "sighted," as in the case of the far end of the bridge from the same position. The doubling of objects on either side of the fixation point is another indirect factor which contributes to the establishment of the third dimension. This doubling can be easily demonstrated by holding a pencil in front of a pen and fixating the eyes on the latter; the pencil then appears double. Reverse the process with the objects in the same position but with fixation directed on the pencil. Now the pen appears double. The doubling of all objects not directly fixated, while generally unobserved with a high degree of attention, does

nevertheless contribute the background to our perception of space.

But individuals with only one functional eye, that is one-eyed or monocular people, can still see objects as solid and locate them at varying distances. With practice they do it very well. For the ordinary individual, not so habituated, this is more difficult. A ring suspended from a lighting fixture is a very poor target for the insertion of a pencil at arm's length with one eye closed. Of course when the other hand is holding the ring the trick is much easier because we can get relative estimations of distance from the movement of our arm-muscles.

There are a number of items that contribute to the perception of distance or depth in monocular vision. Parallel lines converge in the distance, and the position of objects along these lines can thus be indirectly interpreted. Well known figures are absolutely and also relatively larger when near at hand; shadows and the outlines of the figures are better defined and more distinct. Shadows themselves, as every artist well knows, lend depth to objects. Near objects, furthermore, partially hide objects farther off; and then there is the purely physiological factor which may give an unconscious setting, namely the automatic adjustment of the lens of the eye to the point of fixation, known as accommodation.

Before we leave the spatial percept, cutaneous spatial percepts must also be mentioned. For many decades it has been maintained that all cutaneous sensations are experienced with a *local sign* designating qualitatively the part of the body stimulated. We have, for example, not merely "warm sensation" but "warm sensation from the sole of the foot." Analytical observation, however, fails to reveal such an additional quality: we localize usually by some other group of sensations; or the local setting is given unconsciously. But we can very well distinguish spatial forms that are applied to the skin, in which sense we have a cutaneous spatial percept. In the same way we experience spatial relations through kinæsthetic sensations when, for example, we trace in the air an outline of a cross or of the figure "4." From earliest years through reaching for and walking toward objects we learn to estimate distance through movement.

33. TEMPORAL PERCEPTS

Just as the extensive attribute furnishes the basis for the spatial percept, so does the durational or protensive attribute of mental processes make possible our awareness of the lapse of time. When measured against actual physical duration we find results similar to those of spatial perception. Relatively small areas and small units of

time, when filled, are overestimated. A line drawn between two points on the page seems longer than the original space between the points. So estimates of time lasting physically less than .75 second, when filled with rapidly occurring clicks, are generally longer than the actual duration. Contrasted with this, on the other hand, a distance on the floor occupied by a line of people or the size of a hall filled with spectators, is underestimated; and, as we know altogether too well, a long interval of time seems short when we are in pleasant conversation with agreeable company, and seems long when we wait alone with nothing much to do. In all cases the difference seems to depend somehow on the number of physical objects or events that occur, but more careful analyses of the actual mental processes are needed. A remarkable illustration of this experience is illustrated in the report of Commander R. E. Byrd, the first aviator to fly to the North Pole, who writes:

> "Our great speed had the effect of quickening our processes so that a minute appeared as many minutes, and I realized fully then that time is only a relative thing. An instant can be an age, an age an instant."

It is assumed, however, that the estimation of time, and therefore the perception of time, depends upon the process of mental organization or upon some underlying device used consciously or unconsciously in temporal estimation. The small-

est units of time, *i.e.*, under .75 second in duration, are perceived probably in the form of a rhythmical organization of the series of events. Those ranging from .75 second to 4 seconds are apparently estimated in terms of the protensive characteristics of the mental processes themselves and of associated processes. The units of time beyond this limit seem to be estimated only in terms of immediate memory or by inference.

The problem of estimating the duration of time during sleep has also engaged the attention of psychologists. It is commonly supposed that there is a sort of temporal perception which lies in the background of experience and which is based upon certain rhythmical physiological activities which occur in the vital organism of the body.

Allied forms of temporal perception are rhythm and melody. Rhythm consists of certain quantitative and, in some instances, qualitative changes of sensations that are periodically repeated until they become mentally organized into groups. Melody develops pitch changes until the entire series becomes a mental group. Rhythm may depend upon changes in duration of the members and of the intervals between the members, also upon changes of intensity, and, in the case of tones, sometimes upon pitch. These changes may not occur physically at all, as in the swinging of a well-balanced clock-pendulum or of the pendu-

lum of a metronome, but they will be mentally attributed to the sensations that result. Rhythm may take place in terms of auditory, tactual, or visual perceptions and is usually accompanied by marked kinæsthetic sensations, such as are aroused through keeping time with the foot, hand, or finger. Visual rhythms have occurred with the use of colored lights, or with lights differing in duration, brightness, or spatial arrangement.

34. PERCEPTS OF MOVEMENT

We perceive movement when an object crosses our field of vision, or even when we fixate the object and then move the head or body. Movement is frequently inferred when we see only successive positions of a moving object. Under some conditions our percept of movement is just as vivid when we are moving and the object is stationary, as in the case of objects seen from a moving train. Occasionally, however, we assume the movement of ourselves when the object seen is in fact moving, as in the case of a train moving out of the station on an adjoining track or in the experience at amusement resorts of a trip to the moon in a glass cage equipped with moving curtains depicting the imaginary sights on the way thither. But when we are led to perceive movement under circumstances that physically reveal no movement

at the point of fixation, as at a performance of the moving picture theater, then we have a peculiar type of perception of movement known as stroboscopic perception, and the laboratory apparatus which produces this effect is known as a stroboscope. The pictures are thrown on a screen in a long series of instantaneous exposures of slightly different positions in the actual movement. For, moving the film across the light from the lantern while we were looking at the screen would result in blurring the entire picture. The gaps in this case pass unnoticed because the positive after-image is sufficiently long to bridge the interruption. The same phenomenon may be noticed in supposedly "moving" advertising signs or in the crawling sensation of movement on the skin through successively applied stimuli.

There is also a curious after-image of movement that occurs after long gazing at a waterfall or any object continually moving in a given direction. Thus the experience is commonly known as the "waterfall illusion." In the case of a waterfall, the landscape on each side of the fall appears to go up. In a railway car the landscape continues to move after the train has stopped. The driver of an automobile frequently reports that the road appears to move on, or rather the car seems to be rolling backward, after it is positively at rest.

35. SUMMARY

We have seen that a percept involves the direct awareness of objects in our mental environment and that it is a relatively complex process made up principally of sensations with a background of images referring to past experiences and giving meaning to the percept. Meaning may also be had in terms of the association of other processes in the same moment of experience and occasionally in terms of physiological tendencies some of which may be inherited from the past experience of the race. Then the qualitative, spatial, temporal percepts, and percepts of movement were described in detail. Qualitative percepts, like tonal fusions, depend principally upon the combination of different kinds or qualities of sensations. Spatial percepts depend upon the attribute of extent of visual, cutaneous, and kinæsthetic sensations, giving rise to the awareness not only of area but also of depth and distance, due essentially, in vision, to the disparity of the retinal images and convergence of the eyes in the stereoscopic percept and a number of factors in the case of monocular vision. Temporal percepts depend upon the attribute of the duration of all kinds of sensation. Rhythm and melody combine several attributes but are frequently classed as temporal percepts. Thus while we are now discussing experiences more like those

of daily occurrence we find again that scientific analysis and classification help us to understand these experiences by reducing them to simpler terms and by grouping them on this basis into similar classes. We could not explain the percept without a detailed account of sensation and yet the significance of the percept points to a problem that confronts us in our next chapter and will be more adequately solved at that time.

REVIEW QUESTIONS

1. (*a*) In perceiving the expression of adoration in another person's face, how is significance or *meaning* present?
   (*b*) Illustrate an experience in which the meaning was apparently due to an inherited disposition on your part.
2. When through the aid of mirrors or other devices the stereoscopic picture, which normally should stimulate the right eye, is presented to the left eye, and the picture normally received by the left eye is given to the right eye, the object does not always appear turned inside out. Explain.
3. (*a*) In the melody of "My Country 'Tis of Thee" show the influence of the quality, duration, and intensity of the notes on the melody.
   (*b*) Which of the three are relatively the more important?
4. (*a*) Give two illustrations of tactual percepts of space.
   (*b*) Illustrate several varieties of percepts of time when your estimate was much different from the actual physical passage of time.
5. (*a*) Describe in detail the mental processes involved in the motion picture.
   (*b*) Does the after-image "tide over" the successive impressions in "moving" illuminated signs? Explain.

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CHAPTER VI

IMAGINAL EXPERIENCE

"Then I saw him distinctly, moving through the shadows in a little circle of light. His countenance was as clear as the memory of my father's face as I saw it for the last time a few months before. The narrative of his journeyings and trials and disappointments ran without a break. Even certain sentences came to me complete and unforgettable, clear-cut like a cameo."

—Henry Van Dyke, "Preface to The Story of the Other Wise Man."

36. INTERMEDIATE EXPERIENCES

In any classification it is always difficult to draw hard and fast lines between one group and another. And so it is with the classification of *percept* and *idea*. In fact, there are a number of intermediate experiences which are difficult to classify at all. We have already noted that percepts never precisely reproduce the physical stimulus. The sound of a person's voice may give us at once a full percept of the stature and characteristic gestures of some intimate friend of ours. We are sure that it is this person and yet we have supplied many details not present in actual sensa-

tion. This is typical of all our perceptual experiences. The sensory cues, themselves subject to certain modifications through adaptation and after-image, provide the scaffolding upon which a complete mental structure is erected. Sensations are necessary. But the images related to these sensations are for us just now the more important elements in the experience.

Let us take, for example, the experience of looking at a sunset intensely for one-half minute. We then see a negative after-image, consisting of a green disk, wherever the eye wanders. This is obviously wrongly called an after-*image*. More properly as we have noted before it should be an after-*sensation*. It is distinctly an effect dependent upon retinal changes in the eye and that is why we see it wherever we look. On the other hand, there appears frequently in our experience a real image known as the *memory after-image*. If you are taking down an order from someone's dictation it is very likely that you are listening not directly to the sound of the voice but to an echo of it that recurs in your mind. So that if you do not take down the statement fast enough this echo seems to disappear and you then have to recall the phrase or sentence from the more lasting *memory image* itself. Very often when you hear a speaker's voice it will ring for a little while very definitely in your ear. If this re-echoing persists,

then it may even become objectionable. You enjoy a weird melody that you have just heard but if it continues to sing itself wherever you go it is as uncomfortable as the stinging words of a sharp rebuke which constantly return to annoy you in your memories. There may be, on the other hand, pleasant melodies that rehearse themselves for a time in the same way. We all have experienced also clear persistent memory images of a visual sort. Perhaps we have lost something and are earnestly hunting for it, keeping ever before our mind the picture of the lost article. Long after we have found it the picture seems to appear continually before our "mind's eye." Perhaps even more startling is an experience of hunting for objects that are continually found, like berries in the field or on the bush. For a long time thereafter bunches of berries will appear visually, sometimes all through the evening. These apparently approach memory images in type and are sometimes referred to as *recurrent images.*

But of course there is the characteristic *memory image* which is called up voluntarily whenever appropriate subjects are discussed or suggested. Kindred experiences have also been represented in other connections. Sometimes on going to sleep the impressions that have been received just before continue to form fantastic figures with points of light flitting about until they are lost in sleep.

But even then sometimes they continue as portions of our dreams. Some observers have stated that they derive much pleasure from the observation of these curious patterns rearranging themselves as if seen through a kaleidoscope. Such images are known as *hypnagogic,* or sleep inducing, *images.*

Allied to these images but possibly more perceptual in character are the experiences known as *synæsthesia* which is a term of Greek origin, meaning "sensing together." Many people tell us that they can see colors for each letter in a name, for notes in a melody, and for experiences in other sense departments. We have all heard the expression, "a dark brown taste." In synæsthesia the taste would actually be brown. In other words, it is more correct to say that such individuals see a tone or a taste than that they hear it or taste it. A student of ours once complained that the wallpaper in her room actually made too much noise. In this case the experience was turned about so that the sight of the colors produced tones. Experiments have been carried on to show how persistent such experiences are when they occur. When tested out after a number of years very little change was found in the names of the colors mentioned for certain tones. Recently a symphony was written under the name of "The Color Symphony" in connection with which the composer

stated that certain movements were invariably seen as colored. When Liszt became conductor of the municipal orchestra at Weimar he embarrassed the performers at the first rehearsal by saying, "Please, gentlemen, a little bluer; this key requires it." At another time, he said, "This is a deep violet; I wish you would guide yourself accordingly,—not so rosy." Apparently there is, then, in these cases, a very close and ever-present physiological association between the several sense departments. Here the secondary effect is more like an image and yet the person perceives the effect as if it were present in his environment. So throughout our discussion it must be clear that from one end to the other we have a gradual series of images of different sorts. Before going into the subject more thoroughly we have to deal with two topics, those of illusion and hallucination, which are connected partly with percept and partly with idea.

37. ILLUSIONS

In the case of an illusion our percept of the environment is distorted more definitely than the slight transformation that all percepts naturally make. The same book is never experienced twice alike by any individual person, nor is it experienced in the same way by two different individuals. And so, as we have already

pointed out, no percept is absolutely true to physical form. But there are certain general distortions which have been subjected to careful investigation and are apparently based principally on changes in the sensory framework, with perhaps some modification due to our own accumulated experiences. The basic laws for illusions, however, rest on sensory factors and so we speak of them as percepts that have gone wrong. Illusions, in other words, are percepts that in each individual instance do not adequately serve the organism in its environment. We are deceived into physical assumptions that are not correct. The subject is so large, and has so many applications to the problems of everyday life, extending even to the camouflage of war, that much space might be devoted to a detailed description but we shall have to content ourselves with the following facts.

There are three sense-departments—visual, cutaneous, and kinæsthetic—especially the first two, in which illusions are very frequently encountered. In the visual department there are the well-known geometrical or optical illusions (a) of reversible perspective, indicated by the outline figure of a cube or a pair of crossed lines seen either projected forward or backward;[1] (b) of variable or constant extent, as shown in alterations of equal linear distances by adding lines or by filling in

[1] See Fig. 8.

other ways; (c) of variable or constant direction, illustrated in the alteration of the direction of parallel lines by using cross-lines; (d) of associated areas and extents, as in the case of equal

FIG. 8. WHICH WAY IS THE WIND BLOWING?

A problem in reversible perspective.

angles enclosed, in the one instance within a large angle and, in the other, within a smaller one; and (e) of combinations of the various effects enumerated above. There are also visual illusions due to physical distortion through lenses, mirrors, and

the atmosphere, *e.g.*, the mirage; and in like manner there are physiological illusions due to effects produced within our sense organs, like contrast and after-image. The visual illusions of movement, as the apparent movement of the moon among the clouds, and the illusions of distance, as the nearness of a fire or the mountains under clear atmospheric conditions complete the list in this sense department.

The cutaneous illusions include those (a) of juxtaposition, referred to long ago by Aristotle in his example of the apparent doubling of a pea held between crossed fingers, and illustrated also by the reverse effect when the lobe of the ear is bent forward and dull compass points stimulate it and the side of the head in back of the ear at the same time, producing only a single sensation; (b) of parallel lines distorted when drawn across various parts of the skin as, for example, across the mouth from ear to ear or down the arm from shoulder to finger tips; (c) of movement, as when objects seem to crawl across the skin while only consecutive spots are touched; and (d) of the temperature effects noted by contrast from previous stimulation as long ago illustrated by John Locke when the left hand is immersed in warm water for some time while the right hand is kept in cold water. When both hands are then put into lukewarm water, to the left hand it will be hot, to the right cool.

The kinæsthetic illusions are chiefly misrepresentations of weight due to suggestion derived from visual estimation of size, as in the well-known size-weight illusion. A small bottle or other container equal in weight to a large one will be over-estimated in weight because of the unexpected effort required to lift it after you are surprised at its heaviness. There are many other but less well-established illusions such as the lifting of objects from various heights.

The explanations for these illusory effects have been numerous and varied but have followed three main channels. The first, or *physiological* type of theory, most definitely advanced by Wundt, supposes that the adjustment of the sensory organ, or sometimes of other portions of the body, is the essential feature that influences the perceptual result. In the case of visual illusions, where these theories particularly apply, the point of eye-fixation or the direction and extent of eye-movement are primarily responsible for the kind and size of object seen. The point of fixation is assumed to be nearest the observer, other things being equal, and the confined movement of the eye as compared with a more extended excursion in other cases is translated into some change in the kinæsthetic sensations which accompany the respective movements.

Another theory, that of Lipps, reduces the æsthetic effects to *dynamic* factors. Stresses and

strains are read into the figures and thereby distort the actual outlines. Objects are not passively interpreted, but seem to strive, to lean, to support, to push, in short to be active. The specific explanations are too intricate to quote here, but should be read in the original context of the "act" psychology.

And then there is a group of theories which center about the associative setting in the mind of the observer. This may be termed the *psychological* group of theories because, as shown by Jastrow, the lines are effective only in so far as they are assimilated into larger masses and wholes and thereby suggest areas and patterns. The idea of the overhanging cornice forever clinches that version of the famous staircase illusion. The number of ideas which enter in seriously affect the permanency of the illusion, so that if the facts of the illusory effects are known the result may be as quickly destroyed through association as it was originally created by latent meanings.

38. HALLUCINATIONS

In hallucinations the case is quite different. Again, however, there are instances on the border line between illusions and hallucinations that are not so clearly defined. The typical hallucination rests principally upon distortions due to associ-

ated ideas in our minds, as when a person with a fever sees objects crawling on the floor while no sensory basis for this experience exists. But one need not think of hallucinations as being found only among the insane and the mentally or bodily diseased for many of us have been sure that the door-bell has rung or that we have heard footsteps in the next room when we were alone, for which there were no sensory cues at all. We may have been fatigued or frightened and therefore not so discerning in the situations that have occurred. But often even when we are in normal condition we have similar experiences. Examples of such experiences are the faces and shapes which we see in the smoke of the fireplace, or in the tobacco-smoke in the room, or in the clouds, or in the full disk of the moon. Many people enjoy making similar objects appear in ink-blots.[2] Here there is some sensory basis but we supply much more. Such hallucinations are also perceptual in character but the ground for them lies in one's own previous perception, imagination, or memory.

39. THE IMAGE

So we can say that we are beginning to approach a phase of experience that rests upon sensation for its history but is quite different in its actual nature. The term *image* is not a fortunate

[2] *See* frontispiece, Fig. 1.

one because for most people an outline or visual scheme is suggested. As a matter of fact, the word *image* is used in our science to cover experiences analogous to those found in any sense department. In other words, we can have auditory images or olfactory images just as well as visual images. The total or complex image is quite often used synonymously with *idea*. But just as the percept is a complex experience that must be reduced to lower terms, so the idea is frequently found to be quite highly organized and yet it is based fundamentally on what has come to be known as the *simple image*.

40. SIMPLE IMAGE

Difficult as it has been clearly to define and illustrate the sensation, so it is hard to describe and explain an experience that is one step farther removed. Suppose for a moment you imagine yourself in a congregation listening to the vested choir singing some favorite hymn. In your imagination select perhaps the first syllable of the "Amen" and analyze that as if only the tenor were singing the syllable. Even then the image would not be simple. The tenor voice singing that one note is complex and a skilled listener can detect one of the overtones in the group which if analyzed out of the sound would then be a pure tone. Since it does not come immediately through impression

but is recalled in imagination, as you have now recalled it, the tone would represent a simple imaged quality. It must be guarded against having any meaning whatsoever. It must not be imagined as a vocal tone or be designated by any of its musical names. Simply the sound of that one note, intoned in what we recalled from some past experience, would be a simple image. Many of us in the same way can image a pure tone like that given by a tuning fork, but the visual or verbal images of "tuning fork" must not be present. Other experiences can be reduced to simple form at a time when there is no immediate stimulation. Perhaps you can now image the sourness of lemonade drunk during the summertime as a sour quality, not "lemon" sour but just the quality of sourness itself without any accompanying motor contractions. In other words, *a simple image is any qualitatively simple mental process which refers to an object recognized as not being immediately present to the senses.* Some writers have not seen fit to call this by the name *image* but speak of "centrally aroused sensations." In every case one must be sure that the imaged sight or sound or taste is stripped of all reference or meaning which the simple qualities of an image or sensation soon acquire. It must be the same sort of experience that a very young baby would experience just after it has once seen the color of its

bottle of milk and before its motor reactions are started. In many cases it is not possible consciously to differentiate between sensation and image in regard to the contraction of muscles within the body or accompanying certain pressure sensations from the mucous membranes within the body. It is often difficult to tell whether an actual sensation has been aroused by, let us say, a very faint movement, or whether we can sit perfectly still and image that movement of muscles within us.

41. QUALITIES OF IMAGES

In classifying the sensations we have followed a tabular arrangement which could practically be duplicated for images. Probably the qualities would in all cases not be so numerous and in any case they have not been so well checked over experimentally as they have been in the case of sensation. On the other hand, even young children who know very little about exact scientific terms report that they "see things with the mind's eye," or people will report hearing melodies "running through their heads." And very often, too, the sight of worms, bugs or snakes give some people cutaneous or kinæsthetic images that they call "creepy feelings." And in other cases when a ghastly story is told other people image "goose flesh" and a sinking feeling in the region of the

abdomen or chest, as if a crushing blow were struck. In some of these cases the sensation may actually take place but more often it is imaged. Gustatory images can be called up when one opens a box of chocolates and anticipates the satisfying flavor of maple sugar or the bitter-sweet taste of chocolate before actually tasting the candy and before the saliva begins to flow. In the same way the opening of any gift-box is frequently anticipated in terms of vivid images based upon previous experiences. In some cases the observer must be careful to describe the image exactly because frequently, unless he has had training, one type of image will be found to do service for another. It is possible, for instance, to imagine that you hear a melody, when, as a matter of fact, in an extreme case your mind may be absolutely devoid of tonal images. A friend who is a well-trained psychologist and also a good musician once told the author very definitely that he never had an auditory image in his life. But people without his training would have said that they heard melodies because they would have mistaken the automatic throat adjustments, which are really forms of kinæsthesis, for the sound of the melody produced. In other words, this friend enjoyed melodies by incipient humming in the throat. So, many people have to guard themselves against substitution from other sense departments. We can neverthe-

less experience clear-cut images of odors and tastes and sounds that are not translated into other forms. Sometimes long after a dance the visual images of dancing couples will persist but last of all to disappear is perhaps the peculiar fragrance of a corsage-bouquet that is then forever associated with the person who was our guest.

42. QUANTITATIVE ASPECTS OF IMAGES

In describing images fully we must of course assign them the same attributes that we have assigned to sensations. Intensity, duration, and perhaps clearness and extensity, will be the terms that we use to give a complete account of our mental selves when events are recalled to our minds. In some of the experiences just mentioned one might say that the image of a tune was very strong or relatively weak, that the note heard in the "Amen" sounded long drawn out or rather short, and so on through the list of other possible attributes. The description is not complete unless the mental processes are described quantitatively as well as qualitatively. In general most authorities declare that images are less definite, less strong and less durable than are sensations. They seem to lack the insistence and authority of sensations. Exceptional cases, however, occur which lie on the border-line between images and sensations,

and some descriptions indicate that images may be as strong as, or stronger than, sensations. One eminent psychologist has reported seeing negative after-images from imaged colors.

43. IDEA

Just as the most complex process that has developed out of sensation is the percept, so the typical fully developed process based upon the image is the idea. *Idea* may indeed be used interchangeably with the *total image*. It may be described as occurring principally in any quality that has been classified but since it is complex it is apt to have representatives from several sense-departments in it. Ideas occur without any definite initiation from without and are in a peculiar sense the product of one's own mind, but again one must recall that they depend fundamentally upon sensory experience for their genetic origin. Certainly a man born blind could not have visual ideas. He could not see a checker-board in his "mind's eye." He might have it in terms of cutaneous images or of the movements of the arm. We may define *idea* then as *a complex mental experience containing simple images which give it its essential nature but related also to other images, or occasionally sensations, that denote its meaning.* The mental process developed around ideas is sometimes referred to as *ideation.* It is claimed in general that man is

the only animal that has the power of ideation, meaning by that that while the lower animals, like domesticated animals, may perceive meanings in the expression of the face of the master they can not consciously anticipate tomorrow's events or recall specifically what happened to them several days ago. That is the present state of our knowledge, subject to correction from further experimentation. One must also bear in mind that in this connection one is speaking of typical percepts and typical ideas. Border line cases may be present and must be present in the lower animal series if one has accepted any theory of evolution. In his recent studies of apes Köhler states that his animals had what he called a sudden "insight" into a situation which helped to solve difficulties that were encountered.

44. INDIVIDUAL DIFFERENCES IN IDEATION

It is a well-established fact which comes to light even in casual conversation among friends that everyone is given to different methods of thinking, remembering or imagining. Even in the elementary problems of arithmetic some people follow out a formula in internal speech through throat-contractions or muscular sensations, some see the sum written out either in black on white or in white on black, and other people hear themselves or their instructor uttering the sounds of the num-

bers. And so it is in planning the day's work. Some people are fond of laying out their work in a sort of visual diagram; others say things over to themselves or act them out in slight gestures; and still others depend upon auditory cues. Many of us are not given entirely to one or the other of these types of thinking or imagining but do one frequently and the others less often. In playing musical instruments the difference is also often pointed out. In one case a person will play a piece from memory when his memory consists of an imagined sheet of paper on which he sees the musical notation written. It is then definitely either the left-hand page or the right-hand page, at the top, near the middle, or near the bottom. Another will not know what the piece is until he sits at the piano and the keys then touch off images in his arm and shoulder muscles appropriate to the piece. And still another will play from a tune that "runs in his head." Many musicians whom the author has asked about this, say that they use all three cues, but one more than the others.

This illustrates very well a great difference among us. As many as four types of ideation have been made out. We speak of the first type of ideation as the visual type, the second as the auditory, the third as the muscular or kinæsthetic or motor and the last as a versatile or mixed type. In this classification it is noteworthy that a visualizer

seems to have the best of it because his visual scheme can be made to enclose so many details which then can be seen all at once in the "mind's eye." Someone has said that the world's greatest men have been keen visualizers. Other people will remember the sound of the voice remarkably well, indicating that possibly for them auditory images play a large rôle. Individuals are often noticed who can recognize voices over the telephone remarkably well because of the stock and fidelity of their auditory images. Such people usually learn quotations from literature in this form. Then there is the third type of individual who runs chiefly to gestures, grimaces and postures. It may be that the vivacious inhabitants of France, Spain and Italy are given to motor images and talk with their hands. Recently a friend who visited the author from abroad was told that he looked very much like an average American banker, but he wittily replied, "Ah, but you should watch me talk!"

Finally, we have the mixed type which means that people who belong to this group can see the visual expressions in the absence of their friends, they can hear the sound of their voices and can get some of their characteristic gestures as imaged movements in their own bodies. It is a commonplace that on the football field we seem to be thinking chiefly in terms of our own muscles. We have often found ourselves involuntarily moving

on the bleachers towards the goal toward which the team that we were supporting was striving. It is worth remarking here that there seems to be a change with age so that children are almost always predominantly visual in type and as they become older and are more and more used to the spoken word, they therefore develop into the auditory and kinæsthetic type. Words used as symbols have so much significance in our thinking as we grow older that almost all of our ideas have a tendency to become verbal.

45. SUMMARY

We have seen that the transition from the perceptual life to that of ideation is a gradual one. Typical illustrations have been used to show that just as the sensation is gradually transformed into the simple image, so the complex process derived from a sensation, namely the percept, gradually becomes the idea. More than that we have found that while percepts are never accurate in their reproduction of their environment, since a large ingredient in the percept is based upon our own past experience, we can nevertheless make out certain laws for illusions that apply to them because of uniform misrepresentations among the sensory factors. In the same way hallucinations are percepts that have gone wrong, but in this case the error lies in our own ideas. We then discussed

the different types of illusions and their underlying factors, as well as various types of hallucinations. But in the main we attempted to analyze all these experiences and to reduce them to the simple image which represented for the idea a single quality stripped of all meaning. Qualities of images were classified in much the same way as those of sensation and their quantitative attributes were similarly treated. When we came to discuss the idea we found there the analogous complex process to the percept,—only in this case the process is initiated from within our own mental life. Finally, we discussed certain individual differences in the use of ideas. Again we discovered that the diverse nature of our minds can be reduced through analysis to simple categories which when properly understood guide us through the intricacies of the more complex mental operations.

REVIEW QUESTIONS

1. (*a*) Suppose you were staring at an orange for about a half minute and then suddenly turned to gaze fixedly at a medium gray wall. What would you see?
   (*b*) What would a red-green color-blind person see under the same circumstances?
2. (*a*) The next time the clock strikes indicate to yourself the presence of the memory after-image.
   (*b*) Can you now recall the sound of the report of a gun? What kind of image is that?
3. (*a*) Describe some experience in everyday life in which some visual figure gave rise to an illusion.
   (*b*) In what sense are all percepts illusory?

4. (*a*) Analyze your present image of some absent friend and set down all the elementary processes involved.
   (*b*) When you listen to some stirring military march, are your bodily contractions *imaginal* or *sensory* in character?
5. When you say, "I have no *idea* of what you mean," are you psychologically accurate?

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CHAPTER VII

AFFECTIVE EXPERIENCE

"There is a growing interest in emotion. Our intellectual powers—our power to reason, to remember, to imagine, to see—used to receive our almost exclusive attention in the study of the mind. But now we know that the individual's happiness, the happiness of his family, his effectiveness in business, his mental and physical health may be seriously influenced by his emotions."

—G. M. Stratton, "Psychological Reactions during Danger," *Scientific Monthly,* 21, 1925.

46. FEELING

When we read the word *feeling* in any modern textbook of psychology, we find that the meaning is fairly well confined to one set of mental occurrences. Our everyday language, however, is not so scrupulous in the use of the term. "Feeling a piece of velvet" when mentioned in conversation usually means touching the velvet and thus it may be an experience classified largely under the heading of cutaneous sensations. Then feeling is used very often as a judgment. "I feel that he is right," means "I judge him to be right." William James

in his pioneer studies used the term very broadly to cover any sort of conscious process. He made it virtually synonymous with consciousness. When we speak of feeling hungry, thirsty, or dizzy, we are approaching correct usage because here we have recognizably a group of perceptual experiences almost always colored by some form of feeling in the true sense. It is this aspect of our experience, the emotional, or more broadly speaking, the affective coloring of mind, that is described properly by the term *feeling*. The fact is that we do not respond coldly or placidly to the events of the moment but somehow, to a greater or less degree, we are *moved* by them, and we, in turn, give a warmth and liveliness to the things which we do and say through the feelings that stir us at the time. The term *e-motion* carries the connotation of disturbance in it.

Until the present decade, outside of isolated essays and casual references in philosophical works, we rarely find analytic studies made of the emotional life of the individual. When it was morally improper to learn more about the sensory basis of mind, it was indeed much more improper to study or even to admit the emotions and passions that sway all mankind. Somehow in the mediæval ages the ideal man was supposed to be the cold, intellectual scholar who refused to be disturbed by these instinctive responses of the

organism. Conan Doyle describes a man of this sort in Sherlock Holmes when he says:

> "All emotions . . . were abhorrent to his cold precise but admirably balanced mind. He was, I take it, the most perfect reasoning and observing machine that the world has seen. But as a lover he would have placed himself in a false position. He never spoke of the softer passions, save with a gibe and a sneer. They were admirable things for the observer—excellent for drawing the veil from men's motives and actions, but for the trained reasoner to admit such intrusions into his own delicate and finely adjusted temperament was to introduce a distracting factor which might throw a doubt upon all his mental results. Grit in a sensitive instrument, or a crack in one of his own high-power lenses, would not be more disturbing than a strong emotion in a nature such as his."

Today we are ready to believe that the cold, calculating type of man is rather to be feared than to be respected and we are often reminded that the portrayal of Satan and his cohorts is that of an unemotional but scheming and unscrupulous type of mind. In other words, instead of eliminating the emotional life we are admitting it and are attempting to cultivate the more useful affective processes. We know that just as we have to eat and to sleep with a fair regard for regularity, so do we have to balance our mental ration, educating not only the intellectual factors but refining our emotional responses as well. It is the task of

the psychologist to face the human mind as it is, to observe it in all of its works and to understand its every whim and caprice. With full realization of the small achievement in the past, he is all the more eager to fill a long-felt want and to analyze, as best his present tools will warrant, the affective life of man. But again our aim is to reduce what is obviously a very complex set of experiences to their simplest terms. When this is done, almost every psychologist recognizes a *simple feeling* or *affective element.*

47. AFFECTION

When we proceed to analyze complex emotions, we find most investigators agreeing that there are two different qualities of the affective life. They have various names but most psychologists have agreed on these two,—*pleasantness* and *unpleasantness.* In some textbooks the terms, agreeableness and disagreeableness, occur and in others, pleasure and displeasure; and in a few, pleasure and pain. The last two are particularly objectionable because pain is more exactly a sensation which may under certain circumstances be not at all unpleasant,—as when religious fanatics resort to pain in order to achieve a high degree of ecstasy. Even the most frequently used terms, pleasantness and unpleasantness, have this objectionable feature, that unpleasantness is made

to appear simply as a logical opposite of pleasantness so that we have pleasantness and something that is not pleasantness, instead of a new quality. But with this understanding, that both terms are separate and distinguishable qualities in their own right, we can safely proceed to use them. Ultimately then, all of our emotional life no matter how complex, can be found to contain, among other processes, the two simple qualities of *affection* or *simple feelings,* pleasantness and unpleasantness. What the other constituents are, outside of different degrees of intensity, is a problem still to be worked out in the laboratory. Joy and love are both usually pleasant and may be pleasant in the same degree of intensity. What other mental processes or patterns enter into these respective experiences we do not precisely know at present.

Some authorities have mentioned additional qualities to these two, notably Royce who added *excitement-quiescence.* The first pair, *pleasantness* and *unpleasantness,* may be related to all of the *qualitative* attributes of sensation while the second pair is correlated with the *intensive* attributes. Wundt added a third pair of qualities which have been translated most frequently as *tension-relaxation.* He thereby constructed a tridimensional manifold of the affective life. Experimental work, however, seems to have reduced all of these

various affective qualities to the first pair mentioned.

The affective life presents obstacles, however, when the experimental method is tried. For example, we have not nearly the number of qualities to deal with which we have had in the sensory field. This at first blush might appear to make the task easier but as a matter of fact when only two qualities in their several degrees of intensity lie at the bottom of the entire affective life the task of adequately describing the great variety of our emotional responses must be obvious to anyone. Then, too, a more difficult problem presents itself when we realize how completely the affective life, even in its milder forms, overwhelms the individual. It is well known that a sensory experience may be present at the same time with many other types of experience. We can then attend from one part of the experience to another. When an affective quality appears it forms a sort of atmosphere or tone that is spread out over the whole of our mental life for the time being. In this connection the matter of mixed feelings has often been investigated but we are now fairly sure that mixed feelings, that is to say, pleasantness and unpleasantness, can not occur at one and the same time but may only appear in rapid succession. Now this process that sweeps over the whole of

experience is the very thing which we want to observe, but the moment we attentively observe it, it disappears. Affections, as we know from our daily lives, can not be easily scrutinized while they are under way but only in retrospect, and so observation, which means attentive analysis of our mental processes, is hampered at the very beginning. Therefore generally two special methods have been used in the investigation of the affective life. With special or habitual training, however, we may still be able to introspect so complex an experience and one that is so sweeping in its effects as an emotion just as several eminent psychologists have reported their experiences immediately before what they thought was to be their death.

48. METHODS OF INVESTIGATION

We can take advantage of the fact that the affective life of the individual is almost always intimately connected with some form of perceptual and ideational experience. A series of stimuli such as colors, tones, or odors, can therefore be arranged so that the observer will attend to the object perceived and only indirectly note the pleasant, unpleasant or indifferent aspect of this experience. When that is systematically carried out and carefully controlled it is known as the *method of impression,* which is a form of the *method of*

paired comparisons. We customarily pair off every color, for example, with every other color and ask the observer to note which one of the two for the moment is the pleasanter. In another series we check this over by asking him to indicate the unpleasanter quality of the two. In all cases we must rely principally on first impressions and be careful not to allow the word which describes the color tone, or the odor, or other sensory experience to interfere with the quality itself. An observer might very well like a particular yellow but not the word "yellow." The result of this method will be to give an evaluation of color in terms of affection. Another method lately very much in use is called the *method of expression.* It depends on the well-known general relationship between mind and body but especially the effect of the emotions on various physiological functions of the organism.

Elaborate apparatus has been devised for the registration of different effects obtained from the changes in the body. Recording instruments are available for these purposes, chief among which are: the *pneumograph* which has different forms but is used to record changes of thoracic or abdominal breathing, the *plethysmograph,* which transcribes the rate and volume of superficial circulation, the *sphygmograph* which transmits the rate of the pulse, the *dynamometer* or

ergograph which records movements of voluntary muscles, and the *automatograph,* a form of the "ouija" board which records skilled or automatic movements. In addition to these the psychogalvanic reflex is studied through very sensitive devices that respond to the slightest electric currents produced by the body or to changes in the resistance of various members of the body to currents from without. Other skilled movements like singing and instrumental performances in general are lending themselves to careful analysis through phonographic means. The *vibrato* effect of the voice can be micro-photographically recorded from original singing or from phonograph records and analyzed to detect how different interpreters can portray the same passage in music in accordance with their own feelings, or in accordance with the type of feeling desired in the audience.

There is also an increasing interest in the minute analysis of facial expression under emotional stimulation. More recently the secretions of the endocrine glands have been studied by methods for detecting the chemicals which these ductless glands pour into the blood that circulates through them. But these procedures need further technical refinement. There are comparatively simple tests for sugar of blood which is a result of the action of the adrenal glands, and this method has therefore been the most frequently used.

49. SENSE-FEELINGS

As has been noted before there are more or less persistent complexes of sensation and feeling which have technically become known as *sense-feelings*. Among them are headache, hunger, thirst, dizziness, nausea, lassitude, fatigue and suffocation. Some of these sense-feelings have been recently described in connection with other groups of experiences like organic sensations and especially in relation to the mental processes of the aviator.

50. EMOTIONS

But a still more intricate type of experience presents itself in the emotions. Here we have a complex mental process usually started by a percept or idea and involving at once a thoroughgoing disturbance of both mind and body which gradually decreases in its complexity and strength. Throughout there is, of course, an affective coloring of pleasantness or unpleasantness. Other percepts or ideas may appear from time to time and usually near the end there is some other response which is often entirely instinctive. The classification of the various emotions differs with each authority on the subject and we very much need a detailed psychological review of these groups. Some authorities classify emotions on the

basis of their genetic appearances, calling those *primary* emotions which came early either in the individual's own experience or in the experience of the entire race. Examples would be fear and anger. Other emotions in this genetic development would be called *derived* emotions coming later in individual or racial experience. In connection with photographs of emotional expression of the face, G. S. Gates has shown that "More than half of the kindergarten children understood the laughter picture; more than half of Grade I the pain picture; Grade III anger; Grade IV fear; Grade VI surprise or wonder; and the portrayal of scorn is understood by 43 per cent of Grade V." It may well be that this represents something like the order of development of emotion in the individual. There is furthermore some discussion as to whether unpleasantness precedes pleasantness in the life of the individual, or whether the reverse is true. Other classifications emphasize temporal reference as the immediately insistent emotions of joy and sorrow and the remotely insistent emotions of hope and fear.

51. JAMES-LANGE THEORY OF EMOTIONS

In discussing the methods of investigating the affective life of man we mentioned the importance of bodily reactions in connection with the study of these mental processes. When James first sug-

FIG. 9. STUDIES IN EMOTION

What do these faces register?

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6

7

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FIG. 10. STUDIES IN EMOTION

For *Key*, see page 133.

gested in 1884 his now famous theory a number of writers before him had already sounded the keynote and in the following year Lange of Denmark formulated an almost similar theory from the medical standpoint. It caught the popular imagination because common sense had previously dictated just the opposite point of view. As James intimates, "Common-sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike." He states his own theory, on the contrary as follows: "*The bodily changes follow directly the perception of the exciting fact, and . . . our feeling of the same changes as they occur* IS *the emotion.*" In other words, an emotion is nothing more than the experience of motor contractions and other bodily changes that occur instinctively when the object at which the emotion is directed first appears. James thus emphasized the importance of organic and kinæsthetic sensations while Lange stressed the consciousness of the vaso-motor changes in the circulatory system. Later in 1894 James slightly modified his position by admitting, in addition, the pleasant or unpleasant quality of emotion as an essential part of the experience.

The discussion of this theory would fill volumes and has not yet subsided. One of the main issues depends naturally (a) on the exact temporal

order of the items in the experience and (b) on how many of the factors are actually a part of the emotion. The factors are usually three in number: (1) the percept or idea of the object which arouses the emotion, (2) the inherited (some say instinctive) response of the organism, (3) the organic and kinæsthetic, sometimes tactual, sensations which arise as a result of the response—all factors more or less colored by the affective quality of pleasantness or unpleasantness or both by turns. Several psychologists, like Angell, are inclined to think that the question as to the order of sequence is of little consequence. In some emotions each factor may follow in the order given; in others the reverse order may occur; in still others there is scarcely a measurable difference in time between the appearance of the various factors.

Suppose one of the men in charge of our work makes a comment that at first seems harmless. The more we think of it, the more stinging becomes the rebuke. The emotion with its organic disturbance grows in kind and in intensity as time goes on and ideas multiply. Or we feel somewhat despondent and decide to change a mood or emotion artificially, as it were, by walking more erect and by whistling or humming a cheerful tune. These responses then produce the emotional effect as James would have it. Or finally an accident in the street happens so quickly that our perception

is at once emotionally colored and the inherited responses, even their inhibitions, are at once so much a part of the whole experience that it were footless to try to separate the factors in a temporal sequence. Often, too, an emotion is started in the common-sense way and then strengthened or prolonged in the Jamesonian way. Most psychologists would include all of the factors in the complex experience of the emotion. There is also the possibility that individuals may differ in the relative importance of the organic sensations in their emotional lives. The author has had several well trained observers who have failed to record organic or motor sensations with typical emotions. Some of the replies which James received from actors were explained in a similar manner.

52. EMOTION AND INSTINCT

When we describe the actional type of experience in detail we shall have more to say about instinctive reactions and their place in the development of the mental life. For the present we have to note that there is much confusion in the average mind on the subject of emotion and instinct because the same descriptive name is often used for both. Fear, anger, love, hate, may be names either of the responses which we make, or of the way we feel, or sometimes of both factors. Most writers have therefore agreed on a fairly clear-cut distinction, when they are not otherwise

inclined to follow special theories, that the *emotion* shall emphasize the conscious experience, the way we feel, or what has sometimes misleadingly been called the subjective side of the event, while the *instinct* shall center about the actual or potential movements made when the situation is consciously perceived or ideated. Of course the reason for the confusion lies in the fact that from both angles the sequence of events is so thoroughly inherited that radical modifications of emotion during the lifetime of the individual are difficult and rare.

On the whole the present situation is still fairly well described by the famous passage in William James's "Principles of Psychology," in which he said more than thirty years ago, "But as far as 'scientific psychology' of the emotions goes, I may have been surfeited by too much reading of classic works on the subject, but I should as lief read verbal descriptions of the shapes of the rocks on a New Hampshire farm as toil through them again." We very much need a careful analysis of emotion followed by adequate and systematic synthesis of the whole affective life.

53. SENTIMENT

When an emotion is started it usually depends upon some percept or idea which sets off an inherited group of reflexes whose history has little to do with the experience of the individual. If,

however, the affective life centers about ideas obtained from social tradition or educational influences, whether they be from the home or from the school, we have a type of affective life known as the *sentiment*. This must be distinguished from the maudlin type of experience of which we disapprove in the individual, when we say that he is sentimental. As long as there are intellectual ideals and high social standards we have a place for the sentiments. These, then, must be analyzed in the same way that other affective experiences are described. It is worth noting here that, while emotions may appear in the lower animals, sentiments are found only in those higher animals, like man, who have ideas free from immediate perceptual occurrences and who also can be influenced by social tradition.

54. MOOD

Sometimes our affective experiences are long drawn out and never reach a high degree of intensity. In that case we term them *moods*. Moods may linger for hours and days, may fluctuate with happenings outside of us but more often tend to color all the events which come within their span. Emotions tend to prevent the appearance of mental processes that are contradictory to their trend while moods assimilate all experiences and give them local color.

55. DISPOSITION AND TEMPERAMENT

When an affective experience becomes not only long drawn out but habitual in the integration of an individual's personality we speak of it as a *disposition* or *temperament*. There has been a long history to the description of the temperaments. While we still conversationally speak of individuals as having sanguine or melancholy dispositions, we really have no scientific basis for these terms today. An adequate description of the dispositions and temperaments awaits further scientific study of the whole affective life.

56. PASSION

A form of the affective life which is extremely intense, usually of an instinctive nature but rarely of long duration, is called a *passion*. Formerly the term covered all types of emotion,—a meaning which is still somewhat conveyed in the term, "The Passion Play." Its Latin derivation denotes "suffering" in its broadest sense which may then be either pleasant or unpleasant. Apparently all voluntary control is inhibited in a typical passion in the more technical sense and only reflex action holds sway. It is, of course, the hardest of all affective processes to observe in oneself because of its consuming power and of its presumably infrequent occurrence.

57. SUMMARY

We have done little more than to sketch some of the different forms of affective experience and to lay down a program for future investigation. We have seen, however, that most psychologists have agreed upon two affective qualities,—pleasantness and unpleasantness; and that they are following two broad procedures,—the method of impression and the method of expression. The results obtained so far are not lacking in detail but they need further review and systematization. Almost all of our laboratories are undertaking special studies in this field and in a few years definite data will begin to accumulate in such quantities as to warrant the rewriting of our textbooks on this subject. In the meantime our attitude is not one of denial and avoidance of the affective life but of its careful investigation in the realization that many of our social evils today are due to the lack of poise which does not mean an absence of emotion but a want of correct proportion between all of the functions of the human mind.

REVIEW QUESTIONS

1. (*a*) Give five examples of the correct use of the term feeling.
   (*b*) How is the word "sense-feeling" technically used?
2. (*a*) Make a list of your emotions in the course of a day and trace the instinctive reactions in each case.

(*b*) Describe an emotion which appears to lack an instinctive reaction.

3. (*a*) Contrast an emotion started by an idea with one initiated by a percept.

(*b*) How frequent are these two types, comparatively speaking, in the course of the day?

4. (*a*) Distinguish mood and sentiment and give examples of each.

(*b*) Is your dislike for any odor *emotional?* Why?

5. (*a*) Under what circumstances have you been able to introspect an emotion?

(*b*) Describe two auxiliary procedures for investigating the affective life.

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NOTE: The key to the facial expressions of emotion (Figs. 9 and 10) follows:

1. Anger
2. Rage
3. Agony
4. Joy
5. Sorrow
6. Scorn
7. Defiance
8. Resentment

A complete set of these expressions (32 in number), together with explanations and instructions for use can be obtained at nominal cost from the C. H. Stoelting Co., manufacturers of psychological apparatus, 424 North Homan Ave., Chicago, Ill.

CHAPTER VIII

ATTENTION

"Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no *interest* for me. *My experience is what I agree to attend to.* Only those items which I *notice* shape my mind—without selective interest, experience is an utter chaos. Interest alone gives accent and emphasis, light and shade, background and foreground—intelligible perspective, in a word."

—William James, "Principles of Psychology."

58. ATTENSIVE ORGANIZATION OF EXPERIENCE

The psychology of attention is one of the more recent products of the experimental study of the mind. The topic was hardly ever discussed before the middle of the last century, but since then it has come into its own and plays an influential part today not only in psychology itself but in many of the applications of psychology to education, advertising and salesmanship. In spite of its importance, however, the subject has not yet settled down to a stable basis. Psychologists are not all agreed either on its essential description

or its appropriate place in systematic treatises. Some say that it is an attribute of experience in general, some declare it to be a condition or state of experience and still others would make it synonymous with the whole of experience. The fact of attention, however, is well established and it is only when we come to the details as to its nature and its logical place in a textbook of psychology that differences of opinion occur. The fact that our experiences stand somehow organized in patterns of relative clearness and obscurity has led some psychologists to refer to this condition as the *attensive* organization of mind.

It is clear that attention at any rate is not a new process, like the percept, idea, or thought, but rather a state or condition of experience. We speak of a motor car as being in a good state of repair or we speak of a student's standing in the university or a young man's position in the community as being promising and hopeful, or again, we speak of the state of our own health as being excellent. In much the same way do we speak of the condition of mind either as regards the composition of its processes or in respect to the way in which they are functioning. We are all aware of differences in our own mental alertness, in the vivacity of our mental processes, or conversely, in the drowsiness of our mental state or in the slug-

gishness of our thinking. Only on one point is common sense wrong and that is when it supposes that we can ever be inattentive. The school boy who is inattentive does not lack in attention but happens to be attending to other objects or events than the ones to which he is supposed to be attending. Literally, we are inattentive only when we are in dreamless sleep. While of course we experience different degrees of attention at all other times it can never be said that while we are conscious we are not in some measure attentive.

Especially when mind breaks down either temporarily or permanently do we note radical changes in attention. Many of the pathological cases which are lodged in our hospitals for mental diseases show either a rapid shifting of attention with no steadiness in their association of ideas and no ability to hold a group of ideas for some time, or on the other extreme, they manifest an abnormal monotony of ideas where an obsession is held fixedly in mind for a long time. This does not mean that any normal person is incapable of doing either one of these things or both of them for a time, but that normally we are not permanently disorganized in this regard. Again in such abnormal cases nature has performed for us an experiment which we could not perform for ourselves and we see in these extreme instances exaggerations of normal occurrences.

59. SUBCONSCIOUSNESS

Many workers in the field of mental diseases have chosen to speak of the *subconscious,* or in some cases of the *coconscious,* or again in a few instances of the *unconscious,* as though these terms denoted a mysterious mind inaccessible to the ordinary investigations of science or to the individual himself and yet fully established but working independently of the everyday mind. We can not here go into the history of this concept but it is by no means born of the present century. In our literature it is at least a century old, while in Hindu philosophy, it is several thousand years old. Herbart, during the last century, believed that whenever an idea entered the mind it never ceased to exist even though it were suppressed. Under such conditions it lingered in a sort of substratum where it would influence other ideas of its kind. This is apparently the forerunner of the Freudian doctrine of suppressed ideas and a censor ruling over the subconscious with an iron hand, admitting only those ideas into full light which can pass the muster of organized social custom.

It is debatable whether such a term as the subconscious, which implies a mind inaccessible to experimental investigation and certainly not open to observation by the individual, is a serviceable tool for the science. Its meaning would be inconsistent

with the usual definitions set down for mind and experience which are both conscious in the sense that the individual is directly or indirectly aware of them. We do not deny a level of physiological activity that has no conscious attributes and goes on entirely on the plane of nervous impulses. In other words, many events drop out of experience entirely and reappear, with every evidence of having been worked over and improved when they return to our consciousness. In the famous phrase often quoted from William James, which is psychologically sound, we do learn to skate in summer and to swim in winter. In other words, after a period of rest, skilled performances frequently show a higher degree of development than was obvious at the end of the last practice period. We shall recur to this again when we discuss the problem of learning and memory in general. Suffice it now to say that this is one reason why with a long job before us it is wisest to break up the performance into short periods with intervals between to allow for the physiological processes to become organized while we are consciously doing other things.

Another typical illustration of the same sort of thing occurs when we are greeting a friend on the street and our companion asks us the friend's name. For a moment we are at a loss. No name occurs, even though we make tremendous efforts

at recall. Then suddenly, perhaps many hours later, the name appears. Similar experiences are often told in connection with the solution of difficult problems whether they are problems in arithmetic or problems in moral conduct. We try for a moment to find a solution, give it up, and find after a long period that a solution is ready at hand. Some experiences of this type could easily fall under the popular notion of inspiration.

There is another possibility in connection with the subconscious, namely that the term is often used to cover mental processes that have not entirely disappeared from the conscious level but are only obscurely experienced at the time. We are continually absorbing bits of information, cues of all sorts, in the background of our minds. Some of the unusual things that spiritualistic mediums are reported to say are frequently due to information obtained incidentally and indirectly without the full knowledge of the medium. The writer, therefore, prefers not to use the term subconscious but to recognize either one of two other possibilities: first, that nervous impulses may of their own accord organize a certain number of responses on a lower level without the attendance of a corresponding experience; and secondly, that many things are always obscurely yet consciously present with us to which, however, we pay little or no heed. We all have had the experience of

noticing some change in the situation of a room when a clock has stopped or when some familiar picture is gone. Matters do not seem to be quite right and yet when the clock was going and when the familiar picture was hanging on the wall we probably gave it little or no notice. This shows that even while we did not admit that we were attending to these objects they must have produced some effect on us,—however indefinite that effect may have been.

The supposition of several different "minds" in the same individual either from time to time or at the same time may be of practical value for clinical purposes, but most pychologists prefer the view that every normal individual has a single organized mind with the possibility (1) of different degrees of clearness of processes and (2) of some mechanisms proceeding unconsciously in strictly neural terms.

60. NATURE OF ATTENTION

While we have been discussing aspects of attention we have not yet faced the problem of what attention really is. Suppose we are walking casually through the autumn woods, not intent on any one subject in particular, noting now here, now there, an enjoyable bit of scenery, admiring the variety of colors in the leaves and the leafy carpet under our feet. Suddenly there is a great rush of

wings and a partridge takes to flight. In a fraction of a second we hear the report of a rifle and we are thrown at once into a totally different state of mind from the one which we were enjoying when we were first strolling along. While we were casually looking around and enjoying the murmur of the wind in the leaves, our minds were not very alert and active; now we are "all eyes and ears" and our mental processes take the direction of trying to discover where the shot came from and whether it did or did not hit the partridge. There has been an entire reorganization of mental processes. In general, too, we can say that the whole of mind is keyed up to a higher pitch than it was before. Two things then have happened. A new series of ideas,—of imagination, of thought, perhaps of memory,—have thrust themselves upon us and taken the place of whatever else was casually before us. In the second place, the level of our conscious processes has been momentarily raised several degrees of clearness so that however drowsy we were before, much indeed like the autumnal haze about us, now mentally speaking we are "on our toes," expectantly awaiting events.

Similar examples could be drawn from many other experiences of daily life in which the receipt of a letter, the unexpected appearance of an old friend at the door, the notice from the bank that

our account is overdrawn, suddenly turn the orderliness of our mental life into other channels. Illustrations like this, in other words, bring home to the serious student of the mind a new but typical problem.

Let us approach it from still another angle. From the time that we are born, in the state so aptly called by James that of "one big, blooming, buzzing confusion," we are generally assailed on all sides by scores of stimuli. Taking into account the great variety of objects actually present about us we could say that we are assailed by hundreds of thousands of different stimuli of which the organism selects only those for which it has adequate sense organs. But realizing even then the tremendous number of specialized sensory nerve endings with their possible corresponding sensations we could never make progress in the world unless there were some method by means of which mind, figuratively speaking, could select certain processes and neglect others. Putting it another way, mind has to receive its processes on different levels of clearness. If this were not so we should be literally overwhelmed on many if not on all occasions. The more complex civilization became the more hopeless would be our adequate responses to it. By taking a few things at a time and getting them done, we make progress. That is probably why not a few advertisements appeal to the

FIG. 11. THE SELECTIVE FUNCTION OF ATTENTION

After you have found the human figures, can you ever lose them?

In this drawing made from a photograph of a decorative feature which is found over the doorway in a German department store there is shown again the effect of attention. At first glance nothing but a face or mask appears such as is frequently found as an architectural feature in a gargoyle or frieze. During continuous attention, the 9 human figures which make the face appear. Thereafter, one can not see the face without also seeing the figures. Further attention shows figures scattered in the beard, and many other details.

"power of concentration." In a business world where so many things are required to be done one must needs cultivate all the more the ability to attend to a few things at a time. The classical illustration is that of Balaam's ass who was very hungry but unfortunately standing between two exactly equally distant and equally attractive bales of hay. Without the power of attending to one or to the other, by the law of physical attraction he would starve unless some benign wind blew the odor of one bale more strongly in his direction.

In fine, the ability of mental processes to become for a time at least more sharply defined, clearer in nature, with the attendant loss of other processes in clearness indicates the problem of attention. Attention is defined as the state or condition of mental processes which is described in terms of the relative clearness or unclearness of parts of our experience.

61. RANGE OF ATTENTION

So far we have assumed that only a few processes can be called to the front of our mental lives. But we have said nothing about the approximate number that can be attended to. In a general way it is often assumed that anywhere from one to dozens of things can be attended to at once. History records that several famous men, among them Julius Cæsar and Cicero, were able to dictate

as many as seven letters at a time. Some of us have seen expert chess players attend apparently to a dozen or more games at once. Some of us have also heard of people who are able to write two letters simultaneously,—one with each hand. And some boys still marvel at the number of things that the man who plays "traps" does in the band or orchestra. But these are not all clear-cut examples of the range of attention. Certainly the dictation of seven letters or the playing of a dozen or more chess games or other performances of this type requires not necessarily simultaneous attention but successive attention. The mind is rapidly shifting from one object to another.

It is experimentally possible, however, to show that six or seven definite but different objects can be attended to at one and the same time. One method is to expose for about 1/20 of a second a number of letters or numbers so arranged that they will not fall into natural groups and so quickly exposed that the eye will not have a chance to see one after another but must get the exposure at a single glance. If we then have a series of cards, some of which have only two or three letters, others four, five, six, etc., up to ten letters not forming words, or singly spaced numbers, or even a series of characteristic shapes, then the observer succeeds in apprehending all items clearly until the point is reached where more than six

or seven are exposed. In that case he will clearly see on the average only six or seven items out of whatever number be presented. Many experiments have been carried on with this object in view and have almost always come to approximately the same conclusion, namely that six or seven distinct objects are all that we can attend to in a single span of consciousness. Of course, if these numbers or letters form groups of well known meanings then six or seven groups can be as easily distinguished as six or seven isolated items. Various instruments have been devised for exposing objects at a variable and yet ascertainable duration. There must be in the best type of apparatus very little disturbance due to accompanying noises or to the rapid movement of parts before the eye and yet there must be provided a definite fixation point so that the time that the eye takes to accommodate the lens does not interfere with the exposure, but is prepared for in advance. A very clearly and evenly illuminated field must be exposed and for a sufficient duration so that complete visual perception results. Such an instrument is technically known as a *tachistoscope*. Most laboratories are equipped with several forms of apparatus for this purpose.

A recent attempt has been made to refine what has long been called (1) the "range of attention" by distinguishing two additional phases, (2) the

"range of cognition" and (3) the "range of apprehension." In the first case the items are immediately very clearly perceived in a single flash of consciousness, in the second case there is a preliminary attempt at grouping but without verbalizing or ideating the items, while in the last the report of the number of objects seen always depends upon re-imaging the stimulating objects. The answer is never automatically given, but a certain amount of ideation is necessary to establish the number of objects seen and counting may be resorted to. This is all very important and should lead to further experimentation. We are still certain, however, that under the laws of attention the *range* should cover only a single flash or span of experience at the highest level of clearness.

62. STAGES OR FORMS OF ATTENTION

Attention has been found to differ from primitive types of mind to the most advanced. And roughly there have been made out in racial history certain stages of development that tally fairly well with the development of attention at any one time in the individual. Generally considered, there are three stages of attention. They are called by various names in the different textbooks of psychology but while they differ slightly in interpretation, the number is almost always the same.

The first or *primary* stage of attention is found in most of the higher animals and is claimed to be instinctive in character. It is dependent entirely upon some aspect of the object that is presented. Illustrations can easily be found in the advertising field where much is done to secure effective attention on this level. For instance, a stimulus that is unusually intense evokes this type of attention. A loud bell, a very bright light, a sharp pin prick and many other types of stimuli are instances of this kind. Experience is preempted almost in spite of itself by these objects of attention. In the same way a suddenly presented stimulus that is unexpected evokes primary attention. Not only the loudness of the cry but the suddenness of its coming, let us say, in the dead of night is what causes it to be sharply attended to. Similarly, too, certain kinds of screams or shouts or wails secure attention because their very nature is grounded in an inherited response. A moving object is equally effective in arousing primary attention. A movement in the shrubbery, an object passing in the street, are instances of this sort. A new object likewise attracts attention because of its novelty,—something that one has never or rarely seen.

The writer remembers some years ago noticing an advertisement in which an automobile was pictured as if it were being shot out of the air

so that one could see the underworks. It was a novel picture of an automobile and attracted attention to the advertisement. The minds of business men engaged in this field are ever on the lookout for something that is radically new and therefore appealing. Curiously enough, quite the opposite character of an object, that of congruity, hardly ever fails to win attention. Long before Christmas we begin to see objects decorated in Christmas style. The very fact that we are preparing for Christmas makes it easier for us to attend to the kind of things that we are already thinking about. All of these factors, or combinations of them, arouse primary attention, often even against our own effort.

Suppose, however, we are in a situation of being invited to take a motor trip at a time when we are getting ready for some important event, which might conceivably be either an examination in a course of study at the university or some sort of social activity. We are at once beset with a difficulty. Not only one force is attracting us but two or more mutually antagonistic forces are appealing to us and we have to decide to which of the two matters we will turn our attention. This is called the *secondary* stage and it always involves some form of effort because of the presence of several groups of stimuli. Having decided to do one or the other we then naturally pass into a

third stage called the *tertiary,* which is by all accounts very much like the primary stage except for the fact that we have passed through the secondary. We are now absorbed in the thing that we have undertaken, be that the reading of a novel or a self-assigned task of any other sort. We are literally buried in it and giving it a high degree of attention.

63. TYPES OF ATTENTION

There has been some question as to how many different levels of attentive clearness there are in experience at any one time. Some have claimed that there are only two stages or levels of clearness,—a sort of focus where things are most alertly experienced and a fringe or margin describing the obscure background processes and including even such things as the accompanying noises about us, the pressure of sensations from clothes, or from sitting or standing positions, or some of the organic disturbances and contractions that are taking place within the body, to say nothing of the objects in the outlying field of vision and audition. Some have pictured this fact in concentric circles as a focus and fringe, others liken it to two levels,—foreground and background. The symbols simply illustrate approximately the same facts.

The question then arose as to whether there are

not in many cases examples of more than two levels of clearness and some experiments have indicated that individuals differ on this point. At least there is the possibility that there are four or more stages of clearness so that if an individual is asked to rate by any adopted series of numbers the clearness and obscurity of his mental experiences, some will be rated in four or more levels as very clear, moderately clear, fairly obscure, and quite obscure. (*See* Fig. 12.)

64. DIRECTION OF ATTENTION

There seems to be some evidence that if the task is assigned to prepare for an object which is then attended to, its time of entrance into experience is favored; whereas another object occurring simultaneously with it is delayed when not attended to. Several devices in the form of *complication apparatus* have been perfected but the simplest demonstration can be made in terms of the metronome with bell attachment. There is a physical position of the pointer when the bell rings which can be determined in advance of the experiment, but when the observer attends to the pointer the bell seems to come much later than at that physical point, whereas, if the bell is attended to, it rings a little ahead of the mark. The experiment, however, has been questioned and the work needs to be gone over more thoroughly. Some have re-

FIG. 12. A SYMBOLIC DIAGRAM SHOWING A MULTI-LEVEL TYPE OF CONSCIOUSNESS

Various attempts have been made to portray the fact that at any one moment of experience we normally have several degrees of clearness in the mental processes which run their course at this time. Some writers have taken the symbol of concentric circles where the innermost circle shows the most highly focussed and, therefore, the clearest processes. Wundt specifically compares attentive experience to the field of vision in which the clearest part of the field is in focus at the center in the line of regard. Many have, in the same way, alluded to the *focus* and *margin* of consciousness which is again similar to direct and indirect vision. In this diagram the author has attempted to show the possibility of several steps from the region of unconscious physiological processes below the level of mind to the clearest, or peak, of attentive experience. The number of levels is only approximately known. In any diagram, as in this one, the clearer the experience is, the poorer it is in number of processes, *i.e.,* there are fewer processes at the highest level than at any succeeding lower level. The shading in the body of the diagram indicates relative obscurity towards the darker portion, while the sharpness of the contour line indicates vividness of experience.

ported a blurring or retarding effect due to eye-movement. In general it is maintained that attention to objects increases their intensity, hastens the time of their appearance and prolongs their duration, but only in the case when these are marginal or threshold values. It usually takes from 3 to 20 seconds to reach the observer's peak of attention. Therefore in experimental work requiring judgments to be made under maximal attention a "ready" signal should be given at least three seconds in advance of the presentation of the stimulus.

65. SUMMARY

We have come to the point when we find that mind is not adequately described unless some account is given of its orderly organization in terms of the relative clearness or obscurity of its experiences. Certainly all experiences do not come in on the same dead level. The ability to hold a given group of ideas in approximately the same degree of clearness or to shift voluntarily from idea to idea is given to all normal individuals. Attention has, therefore, been defined as the relative degree of clearness of mental processes, and the number of processes that can be attended to at any one time has been described as the range of attention. We found also that attention is subject to certain stages of development either through the race or at any one moment in the individual's experience.

The function of attention, briefly, then, is to permit mind to meet a growing complexity of stimuli with some sort of success.

REVIEW QUESTIONS

1. (*a*) The officer shouts, "Attention!" What happens in the mind and body of the trained soldier?
   (*b*) Sketch in terms of attentive consciousness the events which occur in your mind as you rise in the morning from your night's rest.
2. (*a*) How may the "concentration" of attention in the young child be carried to a fault?
   (*b*) When you are busy doing something important and someone suddenly intrudes, what form of attention may be aroused?
3. (*a*) In reading a well-known passage from the Bible what constitute the mental items clearly attended to?
   (*b*) Other things being equal, can you explain why even very well educated people write or spell poorly?
4. (*a*) Give an instance of a solution to a problem or situation that seemed to come from the "subconscious" level of mind.
   (*b*) When you visit a friend's new home what mental processes are present, but in the background of your mind?
5. (*a*) Analyze your own mental state now and discover whether you are of the two-level or multi-level type.
   (*b*) How has this chapter changed your concept of attention?

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CHAPTER IX

ASSOCIATION

"An hour and a half elapsed before they came back, and when they did come, Mr. Pickwick recognized, in addition to the voice of Mr. Samuel Weller, two other voices, the tones of which struck familiarly on his ear; but whose they were, he could not for the life of him call to mind."

—Charles Dickens, "Pickwick Papers."

66. HISTORICAL APPROACH

As we remarked in our last chapter, the psychology of attention is a relatively new problem in the experimental treatment of the human mind. Association, on the other hand, goes back in its history at least to the time of Aristotle. Before that time Empedocles had considered the world in general to be made up of earth, air, fire and water, but these elements were associated together by love or repelled by hate. Since then almost every great thinker has attempted to set down the laws which govern the connection between ideas. This development of thought came to a focus in the early part of the last century when it became known as the *associationist movement.* The at-

tempt was made at that time to describe every mental process, including the emotions and the will, in terms of some sort of relationship of parts to the whole so that the analysis of the human mind as described by John Stuart Mill is frequently referred to as a "mental chemistry." At one time in the history of psychology the inherent attraction between ideas was considered as a universal principle similar to the force of gravitation.

One of the mistakes which writers of this period very frequently made was to consider the processes that were bound together by the laws of association as fixed mental states. When ideas were discussed the idea was almost always considered as an unchanging element. In other words, mind was made up of a sort of mosaic in which the stones might be moved about in different positions and patterns, but the stones remained ever the same. Another assumption which was made fairly frequently involved the supposition that the mental process exactly represented the material object to which it referred. More than that, the object referred to was often implicitly identified with the mental process. In other words, the object in the material world which was perceived at any given moment was taken bodily with all of its belongings into psychology. The red rug seen on the floor was tacitly assumed to be the same thing as the mental experience of it. This error in one

form or another is commonly called the "stimulus error." We have dealt with it before. But it came in its acute form at this period because the laws of association, among which similarity, contrast, contiguity in space and time were the most frequent, were laws which referred to the similarity, contrast or contiguity of the physical objects and were not at all descriptive of the mental processes which corresponded to those objects.

We are not further concerned here with the history of the subject than to guard ourselves against repeating these errors in our own day. It is safe to say, however, that we shall scarcely fall into them again because of the rapid progress that has been made recently in the study of association. Few psychologists fail to recognize that their task here involves a description and explanation of the orderly march of mental events. Why certain ideas are suggested at one time and not at another time, or hard to obtain at all, is a practical question that often bothers us. With certain individuals it is easy to keep up a conversation. Topics quite naturally suggest themselves and the social hour passes delightfully. With other individuals there is a stoppage of thought, a tension and awkwardness of speech, and an indescribable discomfiture. At certain times in our own individual lives our mental processes seem to speed up and we can not write down our ideas fast

enough for our pens to catch up with the procession. At other times the spirit is willing but the mind is weak and we can hardly think of a thing to write.

Then, we also have the problem of mistaken associations, slips of speech, curious twists of the tongue, and ideas that are not at all appropriate to the matter in hand. An eminent speaker, who recently lectured at the University of Iowa, in a moment of fatigue referred to "Kelly and Sheets" in place of "Keats and Shelley." The Freudians have really done us a service in pointing out that our problems should not be limited to mental events that are correctly associated but should also involve the wrongly associated material, the failure to remember familiar names, the occurrence of social *faux pas*. Reasons for these slips of conduct or of response must be offered by the psychologist as well as for the normal occurrences.

67. PROTENSIVE ORGANIZATION OF EXPERIENCE

The attensive organization of mind describes the limitations of experience. So in a bold paraphrase one might say that "many ideas come but few are chosen." Now, in our study of association we are concerned with the vast storehouse of experience which is at everyone's disposal. This might be named the *protensive* organization of mind. If we consider for a moment the many

things that have been taught us from birth until the present time, even some of the things which we think we have forgotten but which under favorable circumstances will reappear, we will gain a perspective of each human mind that is tremendous in its scope. This does not mean that at any one moment we are able to display all of our mental wares at once. No one can recite everything which he knows. But the possibilities are often there, and sometimes we surprise ourselves at the things which we do remember just as we chide ourselves on other occasions for the things which we persistently forget.

From this point of view mind becomes a vast organization of associated connections. Mental processes are arranged in an orderly series chiefly in connection with the protensive attribute of all mental processes,—or in other words, their connection in time or duration. Mental processes are said to have a protensive organization when they fall into certain patterns either at any one psychological moment of time or in a successive series. A common error that was often made in the historical development of the subject involved the assumption that all mental processes were considered to be successive in nature, idea following idea as coach follows coach in a train of railway cars. But several writers pointed out from time to time that there were also simultaneous associa-

tions and now we have come to consider the simultaneous grouping of ideas probably of more importance than other types. A fusion of tones into a chord either when perceived or imagined is mainly a simultaneous association of various more or less clearly experienced mental processes. The same thing can be said of cutaneous blends, like the pressure from velvet or the perception of wetness and of the various combinations of taste and smell. But even in connection with reproduced mental processes like ideas, often a single suggestion will set off a dozen or more ideas, all occurring more or less simultaneously as parts of a topic.

68. LAW OF ASSOCIATION

We have already referred to various attempts to state the laws of association and have indicated the mistakes that have been made. We, therefore, today no longer formulate laws referring to peculiarities in the physical objects but rather to the mental processes themselves. On this basis the formulation of the law might be revised as follows: *When a mental process that has previously occurred in consciousness is reinstated, other processes that occurred with it on a former occasion tend also to reappear.* The so-called secondary laws of association refer principally to the conditions under which learning takes place and should be discussed under the heading of memory. The

underlying physiological basis is briefly described in the statement that old neural connections tend to reorganize themselves in the old way.

69. THE PSYCHOLOGY OF FORM

Recently a movement has gathered considerable headway in Germany which considers the organization of mind an irreducible and therefore unanalyzable condition. Perceptions, ideas, emotions, and actions, if these terms can at all apply, are the materials of the mind which form the ultimate and irreducible elements. In this type of psychology a mental process may obtain a new significance but its meaning can not be analyzed into lesser elements. This is known as the *Gestalt movement.* One can work out relations between forms (Gestalten) and one can describe the gradual development of these forms, but to reduce them further destroys their nature. What will become of this movement in the systematic treatment of psychology remains still to be seen. For some time mention had already been made of the fact that the protensive pattern is not merely an aggregate or pile of parts—that the *pattern* is really a new relation between parts. In some perceptions no doubt the relation is the first and principal item experienced. A melody, for example, can be torn down to its constituent tones. But the melody sur-

vives even if tones in another register are used and even if slight modifications in the tones, such as added tones or variations, are introduced.

70. MEMORY

While, according to our previous description, the topic of association embraces all mental processes of a complex nature in which simpler processes are incorporated, it is more frequently the practice to consider in this connection the higher complexes of ideas that function as memories, imaginations, anticipations, and thoughts, and the relation of the various complexes, like ideas, perception, emotions, actions, sentiments, and thoughts, to one another. Let us first consider memory.

In the memorial experience there are always at least two factors to be considered: (1) the experience consists almost entirely of ideational material and a feeling of familiarity, and (2) there is a distinct reference to the individual's past. The ideas that occur tend consciously to link the past with the present. This is especially true of all memory images. The *memory after-image,* like the sensory positive after-image, is a brief recurrence of the original effect shortly after its cessation, but not so much dependent on the characteristics of the original impression as is the sensory after-image. It lacks, however, the feeling of familiarity

and the backward reference of the true memory image.

Much of the work on memory is concerned with an analysis of the conditions underlying effective learning, retention, and reproduction; that is, (1) the factors which favor the period of impression, (2) those that make for adequate retention during the interval between learning and recall, and (3) those that influence the recall itself. But experimental work has been concerned for the most part with the first of the three sets of problems. In each case the factors might be assembled under the three heads of (*a*) physical conditions surrounding the individual who is learning, (*b*) physiological conditions of the organism, and (*c*) the psychological conditions in the mind of the learner. Under the first rubric we can include the four conditions mentioned in the earlier laws, like similarity or contrast in the material or its spatial and temporal contiguity, together with such items as: visual *vs.* auditory method of presentation, rhythmical emphasis on the members of a series to be learned, grouping of the members, learning by parts or by wholes, position of members in the series, length of the series, distributions of the learning period, recency and frequency of the associative connection, the rate of presentation, length of interval between learning and recall, amount and nature of distracting stimuli, and the

methods of eliciting the response. Under the second rubric come such considerations as the degree of vigor or fatigue, the age of the individual, the period of the day during which the work is done, and the presence or absence of other physiological disturbances and the general bodily welfare of the learner. The last or psychological conditions involve the degree of attention on the part of the individual, the amount of accompanying interest or feeling, the intention to remember (*Aufgabe*), the amount of actual mental preparation in the field of the subject to be memorized and recalled, and the habitual attitude of confidence in or mistrust towards one's memorial abilities.

The results that have been obtained in connection with these questions and many others since the classical experiments of Ebbinghaus in 1885, are indeed too numerous and detailed to be given here. Among them may be mentioned, however, the effects that they had on our educational practices in the schoolroom and on some of the advertising and selling devices that are used in our popular literature. While there are everywhere qualifications to be made, it is certain that, for instance, advantages lie in the following suggestions: it is best to have the material presented both visually and auditorily, with some recurrent accent or rhythm; while the material to be memorized ought by all means to be learned as a whole,

it is best to divide the task if the entire amount is too great to be kept as a whole; wide distribution of the repetitions of a series to be learned over successive periods has a decided advantage over the method of learning the series with the same number of repetitions during a single period, because as James stated in the example of learning to skate in summer and to swim in winter, progress seems to be made physiologically during intervals that are not occupied with active learning (Jost's law)[1]; slight distraction under certain conditions seems to favor learning mainly because of the increase in the active and attentive effort to learn; accompanying emotion or feeling, like interest, seems to increase the memorial effect, just as healthy, vigorous, and restful bodily conditions improve both the learning and the recall; and there are many recent experiments that prove the decidedly positive effect of mental attitude both by way of confidence in the ability to remember, and the self-instructed intention to recall (*Aufgabe*) what has just been experienced.

Much of this discussion is graphically represented in the *learning curve* which shows by the direction of a line the progress of learning. The

[1] The statement of the law is: "*When two associations are of like strength but of unlike age repetition increases the strength of the older more than of the younger associations; when two associations of equal strength but unlike age the younger fades more rapidly than does the older.*"

vertical units are usually expressed as amount of progress made and the horizontal units are marked off at time intervals at which this amount is ascertained and recorded. The line generally shows a marked rise or increase in the amount of progress during the earlier periods and a gradual flattening as time proceeds, indicating only relatively small increments of progress. There has been discussion of the occasional "dead level" or *plateau* when no gain is made but which is sometimes followed by large increments in succeeding periods.

Memory is sometimes used to cover also the bodily effects of the learning process or occasionally to the tendency exhibited by most experiences to become unconscious responses. In this sense it is called *organic memory*. Talking in one's sleep without dreaming is a clear-cut example.

71. IMPROVEMENT OF MEMORY

Until fairly recently, authorities were divided regarding the possibility of improving memory in any specific case. Now it seems certain that there are physiological limits set in each individual, within which limits there is hope of improvement, but beyond which lies little or none. These limits may be fairly wide in some cases and narrower in others. Those who have early realized their ability to remember have made further gains

through practice and a store of self-confidence. Development usually follows along the lines indicated in the above paragraph and with the development of interest in certain fields or subjects, *i.e.*, with the increase in the number of possible associative connections to be made. Sometimes it is restricted to certain kinds of material like names, faces, musical selections, phrases, or gestures. Most important is the degree of interest and attention given to the task and the specific instruction which accompanies the material, such as, "I must remember that story," or "That's a good quotation to fix in mind." Certain it is now that quick remembering does not necessarily lead to quick forgetting. The memory methods on the market capitalize the above instructions and gain their results in the interest aroused, in the time, energy, and money spent, and in the mnemonic devices such as an arbitrary series of letters or numbers or catch words invented to fix and organize the isolated material presented. Often the momentary association of the material to some significant date or occurrence or object will substantially aid the process of memory.

72. IMAGINATION

Another of the typical protensive organizations of mind is *imagination*. Some psychologists would say that imagination is simply a newer function of

older ideas. On the one side imagination shows its affiliation to memory and on the other to thought. In the first case we have what is known as reproductive imagination and in the second, creative or productive imagination. But in either case the fact is that imagination refers more to the present than it consciously rehearses the past or anticipates the future. We imagine that we are again at the house of a well-known relative who entertained us so hospitably at one time in our childhood days and we live through as in a dream the events that occurred at that time. In doing this we have distinct images, and general ideas concerning various events that happened from time to time in this house. With a slight shift in purpose we go on to create for ourselves the ideal home in which many of the agreeable features of such homes as the one we have just thought of are embodied. Of course we add ideas obtained from many other directions but we create out of it all, something that is typically new. In a certain sense in the psychological world "there isn't anything new under the sun" in any individual's lifetime. All of the materials that go to make up these "air castles in Spain" are grounded firmly enough in the routine experience of our daily lives. But the construction is new and the interrelations of ideas are new. The point of this discussion is that the conscious reference is neither memorial nor

anticipatory. The references in all these are principally to the present. We imagine even though we look to the future in our present mental lives without any reference to a definite future. In other words, we are just dreaming of something that might come true.

73. ANTICIPATION

When we consciously predict what might take place on the next holiday which we are to enjoy we are using a group of ideas in the form of an *anticipation.* Here again in a certain sense we are creative but in this case we are forecasting with a definite time or date in mind, just as in true memory there was a specific conscious reference to the past. Anticipation can refer broadly to any time from the next moment to many years in advance of the present.

74. RECOGNITION

In the same way that memory is a group of ideas with a backward reference plus a feeling of familiarity, so a recognition is a group of percepts referring to the present but with the same feeling of familiarity. Recognition may have several different forms. A number of details may be suggested when we see a person whose face is familiar, but the references are not tangible and definite. You know that you have seen the face somewhere

but exactly where does not appear. In this case recognition is incomplete. But presently something in the response of the individual sets off a cue that gives you a definite bearing on some past event and with this additional cue in mind the recognition becomes practically complete. The whole setting appears at once. Recognition may also show steps of degeneration as when with constant usage our fountain pen is no longer recognized but simply perceived. Members of our family seen day after day can not be said to be recognized at the table but if we have misplaced our fountain pen and have not been able to find it for weeks, or if our parents are absent from us for a long period, then after the lapse of time if we should again see either the fountain pen or the parents they would be definitely recognized.

75. THOUGHT

While we have reserved a separate chapter for *thought,* it is well to recognize here that thought is also a form of protensive organization in which ideas are systematically arranged and come in time to some sort of definite conclusion. There are other developments that take place in thought, such as the symbolization of experience through abstract ideas, but these are considerations which we must take up later under separate headings.

76. TYPES OF ASSOCIATION

Associations of all sorts we find are possible but there are certain recurrent types which must now be more carefully described. Whenever percepts grow with experience taking on successive meanings although the object remains practically the same we can say that association of the type of *assimilation* takes place. As the author picks up from his library table an ink-well that has been carefully constructed by hand this object appears roughly the same to both himself and his friend. But having had experience in the construction of things of this sort the author sees more in the ink-well than a casual observer possibly can. There is assimilated into the perception of the object a number of ideas centering around difficulties in the construction of it and in the harmonic beauty of its design. This remark has often led people to say that given a few minutes of conversation they can tell what are the interests of the individual with whom they are conversing. And so although the ideas refer to similar objects these ideas are often differently assimilated. In this case we have a sort of flashing into the mind of a number of simultaneous associations which give the idea its greatest significance. These associations are then touched off by a single suggestion. In still another way one can talk about a second

type of association which is called the *successive* form. In this case the ideas come more or less in serial order. In writing a letter frequently our ideas are assimilative, occurring too fast to be written one after the other, but often the writing of one subject in a letter suggests the next, and so we go on telling in successive array the experiences which happened to us. The topics discussed in conversation with others often show a continuity of suggestion epitomized in the trite phrase, "that reminds me."

77. METHODS OF INVESTIGATION

A great variety of apparatus is now available for the experimental investigation of associations. Most of the instruments are designed for the purpose of carefully presenting members of a series to be learned under controlled conditions. The methods of investigation fall in two large classes: (1) those examining *new* associations and (2) those examining *old* associations. The first group of methods analyzes associations while they are in process of original formation; the second inquires into associative connections that have already been formed. Because it is necessary to begin with material that has as far as possible no associative meaning and consists of members that are of uniformly equal weight in the series, so-called *nonsense syllables* have been devised. They

consist of two consonants separated by a vowel and are for the most part monosyllabic: NUS, LOM, ZIR, FAP, SOQ, are examples. The second group of methods is divided into the *continued* type in which a word is given by the experimenter and the observer is told to give as many as a hundred words in reply; and the *paired* type, or the method of *paired associates,* in which a single response word is paired off with each stimulus-word. Both of these types, and especially the latter, may be used as a *controlled association* with an instruction to restrict the response to those words that are related to the given or stimulus-word as coordinate, subordinate, or super-ordinate, as similar or opposite, as rhymed, as genus to species or the reverse, and so on; or both types may be given as a *free association* method without any such restriction.

78. THE DIAGNOSTIC ASSOCIATION

Use has been made of the association methods in order to diagnose a concealed situation. It was hoped at the outset to apply the method to criminals appearing before the courts, and some trials of it have thus been made, but the results probably came from the effects of a refined "third degree" in which the accused finally confessed rather than permit the psychologist to receive the credit. In the laboratory it has usually had good success

even with sophisticated observers. The following arrangements are generally made: each one of a series of observers is given the choice of doing one of two or more tasks, like the opening of one of several boxes, the following of one of several more or less complicated instructions, the entering of one of several rooms. In the meantime the experimenter has drawn up a list of single words some of which refer to the one set of conditions, some to the alternative, and some to commonplace situations; these sets of words are given in haphazard order with instructions to reply with the first word that appears after each word in turn is called out; the word and the speed of reply as given by a stop-watch are recorded; and the experimenter, judging from the character of the response-word, the delays in significant responses or in insignificant ones that immediately follow, but without first-hand knowledge, determines what task the observer secretly had chosen to do. The observers are frequently not told to conceal the information, but naturally assume that they are to do so.

79. SUMMARY

We have now seen that instead of describing a mind that is narrow and highly selected we have also to describe it as a vast storehouse of experience subject to the laws of protensive organiza-

tion. The attribute of duration gives a basis for either the simultaneous or assimilative type of association, or the successive type. But in any case in the normal mind every mental process stands in some sort of relationship to every other, which relationship can be changed from moment to moment. The explanations of these relationships are given in the laws of association, together with their physiological explanations in terms of the nervous system. The mental world, in other words, shows on inspection the same orderly arrangement that is found everywhere else in the universe. Recognizing some of the laws which condition favorable association we can build up a system of improvement for memory and a basis of discussion for imagination, anticipation, recognition and thought. Experimental procedures have been developed to investigate memory and association in general and so far a large amount of literature is available for the practical purposes of education and the applications to industrial life. Two types of association were principally discussed,—the simultaneous or assimilative type and the successive type or train of ideas.

Finally, we sketched some of the possibilities that can be followed by using the facts of association to detect crime or buried associations in the mind of mentally diseased patients. This gives us altogether a picture of the large scope of informa-

tion that is at our command in the educated and cultivated human mind. The more orderly our ideas are organized the more useful will they become in the business of life so that education in our universities means not only the accumulation of knowledge but its systematic and disciplined arrangement.

REVIEW QUESTIONS

1. (*a*) Name and explain at least three errors that the earlier interpretations of association involved.
   (*b*) Show how the law of association must be made to cover both the normal organization of ideas and the wrong associative connections.
2. (*a*) State the law of association in your own words.
   (*b*) State the neural basis for association.
3. (*a*) What device have you found most expedient in remembering dates?
   (*b*) Can you justify it psychologically?
4. (*a*) What forms of "memory" lack the feeling of familiarity?
   (*b*) What types of literature might involve reproductive imagination?
5. (*a*) In what ways might the nonsense syllables given in section 77 become meaningful?
   (*b*) How could the *diagnostic association* become of service in the treatment of certain kinds of disease?

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CHAPTER X

ACTION

"The choice is between living up to the light you have or doing something infinitely worse. It is not between living up to the light you have or being guided by an infallible instinct that acts blindly and always turns you in the right direction, just as the needle points to the pole. Matter can act that way, but mind cannot. Matter never errs; it always obeys the laws of nature without varying a hair's-breadth. But mind cannot do right without intelligence to guide it."

—C. E. Garman, *The Line of Cleavage,* in "Letters, Lectures and Addresses."

80. MIND IN ACTION

While many of the lower organisms are truly creatures of their environment man finds himself in the peculiar rôle of being to a great extent the creator of his environment. The mental development in our species has risen to the level where we refuse to accept our surroundings passively without rearranging and transforming them. It is a common notion that the man who lets himself be browbeaten, who submits to his fate, who bows to the strains and stresses of circumstance has not a high order of intellectual development. And

it is probably no mistake in our social fabric that the most highly rewarded men, as a rule, both in industry and in the professions, are men of executive ability. These men are the creators of the forces that in turn shape the environment of men. They are the individuals who do things, make things and, in general, mark progress in civilization.

We need not call attention to the mental processes that produce the most desirable actions in the mental world, but we might indicate here that with all this emphasis on action, an intelligent forecasting of the future and a high order of ideals must in the long run be the constant accompaniments of effective work. Thus is the mind of man able to shape its environment because on the basis of that past experience of the race, which is written in our literature and in our institutions, and on the basis of his ability to predict approximately the possibilities of the future he is able to act intelligently. In a large measure he is able to foretell the result of his action before the action takes place. But this special problem will be discussed more properly in another chapter under the heading of the "thought processes." Of course the ability to predict the possibilities and probabilities of future events and to plan acts in accordance with this prevision, might be for good or for bad,—like the conservation of our forests

and the pension system as well as the terrible engines and noxious chemicals of criminal and promiscuous warfare. The product of man's high intelligence might lead to his own welfare or to his own destruction. For that reason a keen moral sense is as necessary to deliberate action as the process of ideas, without which this action would be impossible.

So in a world of diverse and marvelous achievement we go to an analysis of the achieving mind with increased interest and profit. In the meantime we may rest assured that our experience includes not only the impressions which we passively receive from without or even the many combinations into which these may enter for an adequate awareness of our environment, but that it consists as well of dynamic functions and operations which create new forces in the environment. These changes in turn affect us through new impressions and so civilization goes merrily on. In short, in the case of man we can literally say that man lives very much in a world of his own making.

81. NATURE OF MOVEMENT

The moving picture of mind from that of the lowest forms of life to that of man reveals an interesting study of movements becoming ever more complex. In some of these simple organisms, like the single-celled amoeba, we find the lowest

type of movement, called the *tropism.* Tropisms are found generally in single-celled animals and are sometimes described as being present in plants. In general man has no tropisms. Very small animals, for example, turn habitually either away from or towards the light (negative or positive phototropism); or they move away from or towards the earth (negative or positive geotropism); or they may move away from or towards certain chemicals (negative or positive chemotropism); or they may move away from or towards heat (negative or positive thermotropism).

With animals that have something like a central nervous system movement becomes more highly developed into what is known as the *simple reflex.* In this case we find a physiological arrangement for the reception of the stimulus and a transformation of this energy into nerve impulses leading to a specialized movement peculiar to that stimulus or to a group of stimuli. Simple reflexes are found in man in many parts of the body,—some of the more common ones being the accommodation of the lens of the eye to the distance of the object fixated (ciliary reflex), the expansion or contraction of the iris with amount of light that strikes the eye (pupillary reflex), and the kicking up of the foot when the leg is struck below the knee cap (patellar reflex). From this point on the reflexes become more and more complex, in-

volving several types of reaction, as when the hand is withdrawn from a sharp point or when sneezing takes place. Not one pair of muscles, or even a group of muscles, but many muscles over the body are very generally called into play. Naturally all these responses are largely inherited,—that is, they are not learned in the lifetime of the individual although they are more or less subject to modification and inhibition during his lifetime. We may also say that the simple reflex is really an arbitrary bit of analysis, whereas in actual life it is somewhat influenced by surrounding reflex conditions. When groups of reflexes are formed so that they will respond in an organized fashion to a complex situation then we have the typical *instinctive* reaction. In this case a conscious percept or idea is usually required for the act. In other words, instincts are normally performed on the level of conscious experience since the situation as a whole, not the individual elements corresponding to isolated stimuli, is responded to. Conversely animals whose mental development has not yet reached the level of perception, *i.e.*, whose conscious experience is confined to mere sensory awareness, can not properly be described as having instincts.

One step higher brings us to the *simple impulsive action* where an isolated stimulus novel as regards the inherited equipment of that organism,

like a signal, sets off a learned response. When someone in front of us has dropped an envelope that is within our reach, we stoop to pick it up; when the minister says, "Let us pray," we bow our heads. The simple impulsive type of action has long been experimentally investigated and reveals some important facts which throw light on the whole actional consciousness. Up to the level of the instinctive type of action we speak of responses as *movements,* but as soon as consciousness is a necessary factor we call these responses *actions.* The simple impulsive action develops in two radically different directions. The act may become so habitual that it almost escapes notice, as when a bit of thread is flicked off a coat sleeve, or a tear is wiped off the face. In this case we sometimes call the movement a *secondary reflex.* In the other direction simple impulsive action may become more and more complex. It may develop in any one or all of three directions. In the first place, the *apprehension* of the stimulus may be complex. Was it a letter which he dropped or some piece of waste-paper he wishes to throw away?

The stimulus is not always so clearly defined that action takes place automatically. As civilization becomes more complex some of these reactions depend a great deal on the correct perception of the object in its special environment or "atmosphere." It may also become more complex in the

direction of *motive*. Was the remark made to gain my attention for the purpose of starting a conversation, or was it merely accidental? Would it be the proper thing for me to acknowledge my own curiosity and approach the speaker, or had I better be still and ignore it? And in the third place, the impulsive action may become complicated in arranging a suitable *response*. If I see a person cheating in a business transaction what is the most effective course to take under the circumstances,—to deal with the case myself, to report it to the authorities or to ignore it altogether? When a beggar comes to the door our impulse is to give. Is this the best way to handle charitable cases?

In such ways the simple impulsive action develops into a complicated type of deliberate action where thought processes are called into play and the whole system responds in terms of ethical and æsthetic ideals and our own past experience. As we grow in our contacts with the world we have ready means of dealing with a host of complicated situations because of repeated experiences which we have had through our past lives. So far action has been voluntary, that is, it is initiated and guided by our desire in the matter; but finally we come to the highest development, that of volitional action, which involves the character of the individual and gives action sanction through some

verbal formula or its equivalent signifying, "I will"; "I must do this now." A supreme effort is made in terms of the complete organization of the mind and a final resolution develops to do it at all costs. Thus we have seen in panoramic survey, as it were, the development of action from the very lowest forms to the highest form found in men of mature experience.

82. THE CONDITIONED REFLEX

Many investigations have been made into a form of response known as the *conditioned reflex.* A reflex is said to be conditioned when in addition to the usual stimulus which is adequate for a certain response another stimulus also becomes effective. In the classical example of Pavlov's dog, the dog was shown to be affected not only by the sight of food through a mirror, but by the sound of a bell which was made to accompany the sight of the food. Finally, the sound of the bell alone was sufficient to cause saliva to flow. Arguing from this to some of our own experiences it might be appropriate to say that the ringing of the dinner bell probably causes the digestive fluids to function in advance of the actual sight or smell of food. In many cases one can actually cause saliva to flow with the suggestion of certain foods like sour lemonade or freshly cut apple pie, in which case there has been a further substitution

of the idea for the actual stimulus. Experimentation on this subject is proceeding and so far a number of substitutions have been made. But up to the present the knee-jerk (patellar reflex) has not been conditioned in man.

83. INSTINCT

We speak specifically of instinct as we have in the preceding section when we mean any organized response to a more or less complicated situation on the basis of inherited neural connections. As indicated before, the chick pecking its way out of the shell, the dog hiding a bone, the squirrel digging up a nut, are all cases of apparently consciously performed acts where the motive is unconscious and the plan of action is for the most part not the result of experience. The difference between a highly complex reflex movement and an instinctive action is that for the first time in the genetic development of the actional consciousness there appears to be a perceptual experience of the conscious sort. The building of a nest or a spider-web, or of a dam is not conceivably just a set of stimuli each added to the next with its correlated response but a perception of a total favorable situation with its inherited motor reactions. When we discussed emotions we showed that the objective behavior of the organism is more properly called an instinct, while the

subjectively toned experience during this act is described as the emotion. Commonly fear and anger, for example, have both aspects.

84. HABIT FORMATION

When actions are learned during the lifetime of the individual and finally require no great degree of attention we speak of them as habits. The stimuli are usually consciously observed, though not in a high degree of clearness but there is no conscious motive and no planning. Of course this is descriptive of the completed habit. Anything short of this must be discussed under the learning processes. As mind becomes more and more organized many of the responses learned earlier in life become a part of our mechanical responses, especially those acts which we have learned during childhood, adolescence and early adulthood. It is much more difficult to acquire new habits late in life or to change habits already formed in earlier life.

85. LEARNING

Volumes have been written on the subject of the psychology of learning, especially in connection with education. This is not the proper place to discuss learned action in great detail. But it is worth noticing that the learning curve takes either one or two forms. Either it is a curve gradually sloping from bottom to top, as the units of prac-

tice are laid down from left to right; or it sweeps down from a high point to a low point in the general direction from left to right (*see* Fig. 13). In the first case we are measuring amount of *progress* made, which in the beginning would then be very small but on succeeding hours or days of practice becomes increasingly greater. In the second type of learning curve (Fig. 14) we measure the amount of *time* required to perfect the act, like tossing two balls in the air and catching them. At the end we perform the act correctly with a mini-

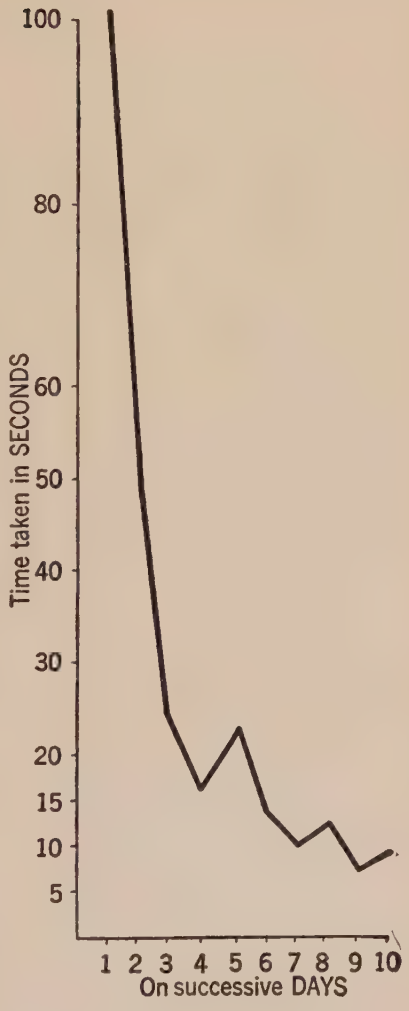

FIG. 13. A TYPICAL LEARNING CURVE

In terms of Time Consumed.

(Adapted from Anderson and Smith in experiments on maze-learning in the white rat)

mum expenditure of time. Both types of curves have characteristic elements. The amount of achievement is relatively large in the beginning

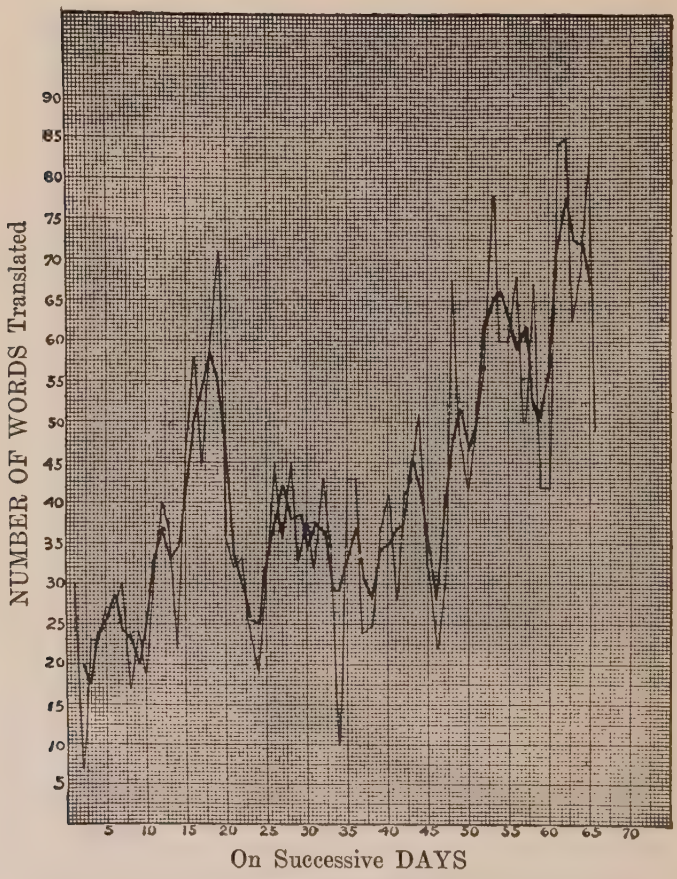

FIG. 14. LEARNING CURVE IN TERMS OF ACCOMPLISHMENT
Heavy line indicates smoothed curve.
(From Swift's experiment on learning the Russian language)

and then at each succeeding trial the increase is relatively and progressively smaller. Sometimes accomplishments seem to be at a standstill and we have what is known as the *plateau.* Much has been written about this stage. It may be either a flagging of interest, or achievement may take place on unconscious levels while there is no apparent outward manifestation of the results.

86. PERSONAL EQUATION AND REACTION TIME

Experimental psychology was given a fair start when an assistant in the observatory at Greenwich, England, was dismissed for his slow reaction time to the transit of a star. A fraction of a second was a good deal to be late in the profession even in those days. It was the business of the astronomer to pull a string by the so-called "eye and ear" method which stopped the clock when the star was crossing the middle hair-line of the telescope. Friends of the unfortunate scientist took up the question of what was then known as the *personal equation* in realization of the fact that between the physical occurrence of the transit of the star and the mechanical stopping of the clock, an unknown factor, the individual, was introduced. Little was known about the speed of nervous conduction and much discussion centered on the subject of the paths over which nerve impulses traveled. But the physiologists were not very suc-

cessful in measuring velocity of nerve impulses because disturbing factors arose in connection with the problem of the control exercised by the brain. And so the problem was turned over to psychology.

The early psychologists of this country received their training in the Leipzig psychological laboratory established by Wundt in 1879. Here many problems of reaction time were attacked. But it was not until Ach in 1905 systematically presented an analysis of the actional consciousness in which the total experience from the preparation for performing the act to the period after the action had been completed was investigated. He fractionated this whole span and called the first part, from preparation for reacting to a signal to the appearance of the signal, the *foreperiod* (Vorperiode); the time consumed after the signal was presented and until the action was made, the *midperiod* (Mittelperiode); and the after effect following the reaction, the *afterperiod* (Nachperiode). By an introspective analysis of these periods it developed that the principal difference between individuals lies in the way in which they interpret the instruction (*Aufgabe*). If a person is of the "hair-trigger" type and pays relatively little attention to the nature of the signal, he gives a comparatively fast reaction time. All individuals with the instruction in mind to "beat their own record"

will give about the same reaction time to a particular stimulus. The careful person, on the other hand, who makes sure of the signal gives invariably a slower reaction time. It is as if you made certain who said "hello" before you yourself would respond; whereas another person under a different instruction responds at once, regardless of the tone of voice of the original "hello." In other words, if the perception of the stimulus is the clearest item in attention and consciousness assumes an apprehensive aspect, the reaction will be relatively slow; if the motor response in terms of kinæsthesis is chiefly attended to, consciousness is of the motor type and the reaction will become comparatively fast.

Of course the time measured by very precise instruments in one-thousandth parts of a second depends on the character of the stimulus. We represent this unit of time by the Greek letter sigma (σ). Values so far obtained when the observer is reacting as fast as possible (muscular reaction) are: to light, 180 σ; to sound, 120 σ; to electric cutaneous stimulation, 105 σ; whereas the slower reactions where attention turns to the stimulus given (sensory reaction) is: to light, 290 σ; to sound, 225 σ; and to electrical cutaneous stimuli, 210 σ.

Also mixed forms of reaction occur where the observer follows now one type of instruction and

now another, in the meantime shifting the direction of his attention to various phases of the experience and thus delaying his reaction. Naturally in all cases fatigue and practice as well as other bodily conditions may alter the value of the figures given.

87. WILL

Because of various religious connotations we now have as little use in psychology for the term *will* as we have for the term *soul*. If the will means anything in psychology it is practically synonymous with volitional action, in which the individual, as was indicated above, brings into service every last resource of his mental equipment. In other words, he underwrites his conscious action with his personality and acts in terms of a consciousness of self. Very frequently in "willed" action a man may say perhaps in an undertone "I will," or he may have a group of organic reactions in his body meaning the equivalent of this phrase.

88. SUMMARY

We have tried to portray in this chapter the complete executive arrangements for putting mind into action. We have seen that man is not content to take the environment as it is, but produces results which in turn become the environment of the succeeding moment, of the succeeding day and of the ages that follow. Thus man has created

institutions of learning, has established social sanctions which are in turn constant reminders of previous experiences of the race. In small as well as in large ways, then, through the presence of free ideas, man is able to forecast emergencies and to provide against them as much as lies in his present power. Action has its beginnings in the simplest tropisms and develops through a long series of complex movements, like reflexes, into instinctive and impulsive action until the higher complex experiences of volitional action are reached. The personal equation, born of a controversy about individual reaction times is now reinterpreted in terms of the instruction, either habitually given to oneself or grasped from moment to moment. A large amount of experimental work has been done on the reaction time. It has revealed the force of the instruction to attend clearly either to the perception of the object or to the muscular contractions which result. And finally, we see through the use of volitional action the highest form of executive organization where the entire self stands behind and supports the action taken. All told, we have attempted to portray the actional side of mind, just as in our previous chapters we have developed it on the side of more or less receptive perceptions and ideas and the associated organizations that arise from these processes.

REVIEW QUESTIONS

1. (*a*) Briefly describe three kinds of tropism.
   (*b*) Describe a simple reflex in the human body.
2. (*a*) Criticize the statement: An instinct is nothing more than a group of reflexes.
   (*b*) Distinguish the *instinct* and the *emotion* of anger.
3. (*a*) Can putting sugar into a cup of tea or coffee become a series of *secondary reflexes?*
   (*b*) Analyze the *motive* in the complex impulsive reaction of publicly greeting a person with whom you have recently had a quarrel.
4. (*a*) To what extent can you speak of a "habit of thought"?
   (*b*) Trace the early development of the habit of writing with a fountain pen.
5. (*a*) Suppose your reaction-time is persistently different from that of a friend. How would you explain it?
   (*b*) Work has been done on a series of tests for the "will." What, psychologically, is the nature of the "will"?

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CHAPTER XI

THOUGHT PROCESSES

"But I cannot recite, even thus rudely, laws of the intellect, without remembering that lofty and sequestered class of men who have been its prophets and oracles, the high priesthood of the pure reason, the *Trismegisti,* the expounders of the principles of thought from age to age."

—Emerson, "Essay on Intellect."

89. REASONING IN MAN

Man is typically a thinking being,—not that he thinks all of the time or even most of the time, but of all the animals he is the only one, as far as we know, who is capable of thought as psychology now defines it. Much confusion in the history of psychology has arisen from the assumption that man is essentially a reasoning being because many former investigators believed that psychology chiefly consisted of a logical analysis of intellect. There was a time, as we have noted before, when other operations of the mind were supposed to be unworthy of discussion, to say nothing of analysis. But the rational processes were almost always related to the spiritual con-

cept of the soul and therefore became the object of careful study. So we may say today that a description of the thought processes antedates all attempts to analyze other phases of the mind. It will be seen at once, however, that in a certain aspect this is really detrimental to the clear understanding of the thought processes because the purely deductive type of investigation is now out of vogue in science, and yet that was the only approach to the problem of thought which was current until near the end of the last century. Thought processes were therefore practically the last to invite an experimental attack upon them. Now we have the curious spectacle of a logical account of psychological reasoning turned into a psychological account of logical reasoning. Many of the modern textbooks of logic treat the subject chiefly from the psychological side instead of giving, for example, the usual formulæ connected with the syllogism.

A moment ago the statement was made that man is probably the only animal who reasons. This is in part due to the fact that we so define reason as to exclude all but a certain type of process and in part due to the fact that so far as we have investigated the matter there seem to be no "free" ideas in the lower animals. Whatever images occur seem to be immediately attached to the direct apprehension of objects in the environment. But to call

up ideas on the spur of the moment without any direct relationship to the immediate situation and to forge ahead through a problem on the basis of these ideas is apparently given only to man. In some recent experiments by Köhler with monkeys as subjects there was evidence that these animals may reason in a primitive way when, for instance, they put several sticks together to make one long enough for the purpose of reaching a bunch of bananas outside of the cage. A question arises as to whether the situation was reflectively thought out in the same sense that we reason out a plan of action or whether the animal perceived in the stick a situation in terms of images immediately attached to the experience itself. Köhler termed their experiences an "insight." Further experiments along these lines may reveal some very important facts.

90. FUNCTION OF LANGUAGE

One of the products of reflection is *language*, but it is also in turn a further incentive to thought. Language is one of the tools of thought. In this sense we use the term, of course, in its widest application, covering even such phases as the language of flowers, of gems, of gestures and of facial expression as well as of the spoken word. But of all these the spoken language has developed furthest as a tool for thought. The utmost refine-

ment occurs in the nice selection of words in order to convey precise meaning from man to fellow-man. A conversation with a person reveals not only his own cultural background but the extent to which his mind has been disciplined, for slovenly constructed sentences are not only the children of unrefined thoughts but in turn are the parents of uncouth meanings. Just as the instruments that science has developed are partly responsible for making headway in its own more careful investigations so progress in the world's thought has depended on the exactness with which meanings are conveyed from one generation to another. As the blunt knife develops into the microtome so a slang word develops into the precise term of science. A rock in geology no longer means the same thing that it does to the boy on the street, nor does mind as defined in this volume mean the same thing as it does in the colloquial phrase, "I gave him a piece of my mind."

With the use of words a curious transformation occurs which is typical of all symbols used in the thought processes. When words are used in this way neither the idea of the word or its original percept refers to the word as an object. If a word is printed on the page there is no longer in the mature mind the percept of that word as it stands, but of the meaning that it gives. Sometimes in a moment of fatigue after considerable reading the

letters of certain words will look to the author as very strange objects. This has occasionally occurred with the word "eight." Recently a similar experience happened with the spelling of the word, "should." There was a time, of course, when everyone of us had to perceive words originally as words and then recognition of them would take place on their own level and in their own right. But with great familiarity the word is lost in its original significance and simply stands for a certain kind of experience. Of course similar transformations occur with the faces of well-known friends or of our relatives. We no longer see the lines of the face and eyes and mouth, or the whole face, as a distinct object but we experience the loveliness, kindliness and tenderness of our mother's character first, as expressed by that face. In this manner we sometimes talk of a "Christ-like" face or of a "Santa Claus" face. In much the same way the words in which the author has here expressed himself are not considered as mere visual percepts interesting in themselves but may under favorable conditions become symbols of thought. Some very fruitful experiments along these lines have been carried out in connection with various steps in the process of learning foreign languages and similar work has been done by several psychologists in the learning and interpretation of gesture language for the deaf and dumb.

While language is the chief vehicle of thought there are many other symbols which can be used in this way. Some of our ideas of objects assume picturesque and even grotesque forms as life goes on. Old age, to the author's mind, is represented by a curved line slightly thinner at the one end, tilting to the ground. It is very likely the vestige of a bent and decrepit man. Similar images in the several sense departments must occur to anyone who has analyzed his mental processes in this way. The visual image of a hazy, dark brown spot may mean "sickness-doctor-medicine." The picture of a view down a long straight corridor may mean "infinity"; and a curved rod slightly draped at one end may mean "death." While as life goes on, the details of these ideas may be practically wiped out, in almost every case a history can be traced. The dark brown spot refers probably to some medicine impressively taken in childhood; the long corridor may have seemed altogether too long for youthful legs in a moment of great weariness and the curved line probably refers to the figure of "death the reaper."

91. DEFINITION OF THOUGHT

The thought processes are interpreted differently by different groups of psychologists but most authorities agree that some form of imagery is necessary for thought. In other words, the important item in the thought process is the idea.

A minority of investigators in this field report "imageless thought" and some speak of the "thought element" as though there were no other mental process present. But even those who consider ideas essential for the thought process have at times reported what is best translated as a *conscious attitude* or *mental attitude.* These phrases refer to a meaning which apparently is not couched in verbal or visual images but may be kinæsthetic. The conscious attitude is nevertheless packed with meaning and comes upon the individual in a moment. Sometimes when you are suddenly given a difficult proposition to work out, whether it be one in mathematics in school or a professional situation at the office, you are at once overcome by a sort of helplessness which is apparently unanalyzable. A number of guests arrive without warning and for a brief space of time your mind responds with nothing else but a feeling of perplexity. After that you work your way through to a fairly decent solution. Other attitudes of this sort are: doubt, effort, conviction, hesitation and complexity.

Normally, however, thought arises, as some psychologists have expressed it, when conscious reactions are unexpectedly blocked. Just as it is claimed that conscious action itself arose when reflexes were no longer adequate for making satisfactory adjustments to the environment, so later thought processes arose when conscious action

could no longer depend adequately for its cue on the immediate perception of the situation. A "problem" arose whose solution was not immediately perceived. In discussing the higher forms of action we found that the total situation sometimes presents difficulties which can not be entirely apprehended or met in terms of percepts or sensory experience. Ideas are called in, sometimes whole series or groups of them. There may be a certain amount of "talking it over to oneself" either in terms of verbal ideas or in partially initiated internal speech (subvocal response). Sometimes the barriers that represent the difficulty are gradually worn down through a series of circumstances depicted in visual diagrams as in blindfold chess-playing. Sometimes auditory ideas play a part in the answer to the problem like Tennyson's "still small voice" or the "daimon" of Socrates. When these conditions in general are fulfilled we have a thought-process: there must be (1) a conscious realization of a problem, (2) an ideational process of solution of the difficulty, (3) a concluding effort giving an answer to the situation, even though it be a tentative one. When this process is protracted and proceeds in stepwise fashion it is usually discussed as reasoning. In general, then, we may say that thought is the *solution of a problem consciously given and realized in terms of the symbolic use of verbal ideas, of other images, and occasionally of conscious attitudes.*

92. CONCEPT OR ABSTRACT IDEA

Many attempts have been made to classify the different kinds of ideas that are used in thought and some experimental work has been done on them. Two kinds of concepts or abstract ideas are in general described,—the one called the *representative* idea and the other the *typical* idea. If, for instance, we use in the thought process the concept of boy, the representative kind of idea might be a somewhat hazy outline of a boy or it may be even a well-known boy whom we now take as a sample for the class. In the typical idea, however, we may use for the meaning some rather strange device which has no apparent connection with the object thought of. This idea is used more frequently with meanings that are fairly abstract like virtue, cheerfulness, strength, and the like, and, as has been pointed out before, the genetic reason for the peculiar symbol may somehow appear, but not on the surface. Almost all words are typical ideas, unless they are onomatopoetic, or words that sound something like their meaning, as "bow wow," "hurrah," "filthy," "bazaar." Both kinds of ideas are used in the thought processes although there is a tendency to use the typical ideas with abstract subjects that are far removed from their concrete objects and are symbolized by curious images and words. The term, concept, is

used interchangeably with the phrase, abstract idea, when the idea occurs in connection with the thought processes. Of course ideas may be used elsewhere as we have seen, *e.g.*, in memory, in imagination and even in emotion.

93. REASONING

Reasoning is the attempt of the mind to organize its experiences. Mind trying to make order out of chaos in a conscious way is said to reason and reasoning is mind working under such conditions. The important element is that there must be a conscious intent to systematize experience. There must be the conscious endeavor to make miscellaneous experiences conform to some rational pattern. When the ordinary instinctive responses cultivated through generations of inheritance, or the reactions habituated in the individual through his lifetime, fail to succeed in any one situation, the individual sits back mentally and takes notice trying the while to find a solution. In everyday language the individual is "up against it." Then in much the same way that we have outlined in connection with the actional consciousness and in thought processes at large there is present in the mind a forecasting of consequences and a mental review of a number of trials instead of an execution of them at once in terms of movements of trial and error.

In other words, the adequate response is delayed. By visualizing the situations he can predict not only his movements but the results of these movements many steps in advance of the actual response. This is reasoning. Anyone who has watched chess players at work or has played the game himself knows that only the unpracticed man needs to put the various pieces in their proposed places by hand in order to see the game several steps ahead. The good player can do this as we say "in his mind" and think his way through.

Reasoning, therefore, is the step-wise, or more or less formal process, of solving a puzzling situation. There are usually four steps involved. At the beginning the smooth course of everyday existence suffers a sudden interruption. We are unexpectedly prevented from doing what we set out to do. Mentally we are "cornered." The next step involves a careful scrutiny of the situation in which we find ourselves. If our car has run into a ditch and the ordinary progress of events is stopped we get out and look the situation over. In this stage we may make several judgments, including some that are utterable but not printable. In the third stage we refer back to our own past experiences which may be either of somewhat similiar nature or may involve the experiences of others in like circumstances. These are applied and their outcome weighed before the problem is

completely solved and the car is out of trouble. In the last stage we apply the processes deduced in the previous stage and observe them at work, in the meantime making such modifications as may be necessary. No matter how much man knows he can not absolutely and safely predict all the consequences of his deliberate actions. Therefore a certain amount of readjustment that has been unpredicted takes place as the processes are applied.

94. JUDGMENT

Judgment consists usually of a verbal verdict made in connection with some problematic situation. "That was a stroke of good luck"; "he surely is a square man"; are instances of verbal judgments. In some cases a gesture is sufficient, as in classical times thumbs down meant disapproval, or the clapping of hands today means approval. Again it may be entirely ideational and unexpressed, as the satisfaction one feels at having done a job right or at seeing someone who is respected and beloved fighting his way ahead.

Some writers have interpreted judgment to be something more than a declaration either expressed or implied and have made it in some cases as simple even as a perception. If one perceives an apple as red, one writer believes that a judgment has been made. At any rate, this is not a typical judgment and the use of the word in that

sense undermines the exact use of the term. Of course the judgment when made may take but a moment or it may take weeks. Scientific men are in the habit of suspending judgment almost indefinitely in the absence of precise data. The relatively uneducated person on the other hand makes many off-hand judgments without sufficient warrant. Often we have to make a tentative judgment adequate on the basis of all the data that are in at the time but subject to revision when more facts are known. Thus the scientific psychologist as a rule says that scientifically telepathy has not been proved and thus declares himself on the subject, but he says in amendment of this that positive evidence may some day be brought in scientifically to convince him of the reality of this supposed phenomenon. We shall deal with this subject later.

95. INDUCTION AND DEDUCTION

Logic, which is the description and discussion of the formal process of thinking has traditionally had much to say about various kinds of inductive and deductive reasoning. When the process is the usual scientific one of gathering in a number of observations in a more or less limited field of activity and of reaching certain conclusions on the basis of these observations we call the method of reasoning inductive or *a posteriori.* Out of this a theory or hypothesis may develop which from a few particular facts is made to cover in a general

way all instances, even those not observed, that come under these specific conditions. When on the other hand, as was done much more frequently in the middle ages, a particular idea is taken, like the concept of an angel, and from this is deduced a number of possibilities, including the question as to how many angels can dance on the point of a needle, we have a fair sample of the deductive method. There is no attempt in this method to try the problem out experimentally or even empirically, that is, to withhold decision on the basis of observed or experienced fact. The only requirements are the original set of concepts, what they logically involve, and a lively application of the dialectic argument. As a matter of fact, in the ordinary reasoning process both forms are used. It is difficult to separate them. In the elaboration of scientific method there is even a considerable amount of deduction from previous parts of the procedure, but in the end recourse is always had to an actual trial under the conditions desired.

96. SUMMARY

The highest mental process discussed in the mind of man is the thought process. Mind attempts consciously to work out certain situations that confront it, not in terms of actual trial and error in which the explicit movements must be made, but in terms of ideas that forecast the outcome of action. But it is not necessary to apply thought

only to action. Many of the questions which bother men's minds are thought through quietly and carefully to some sort of tentative conclusion. For this purpose man has fortunately a number of convenient devices including those of language, which make his thinking not only precise and accurate to himself but to others with whom he wishes to share the fruits of his thinking. Civilization is so complex that no one in his own lifetime can think through all of the problems that naturally are presented to the individual. He must take stock of the thoughts conveyed through the literature of past generations and through the writings of men living in his own day. In terms of solutions thus obtained he declares himself in the form of judgments which in turn guide his own life and the conduct of others. This ability, while found perhaps to a limited extent in the apes, is the peculiar endowment of man as the highest of all the animals and furnishes his mind with a constant incentive to learn more and more of the world in which he lives. When man no longer desires to think he is ready to die.

REVIEW QUESTIONS

1. (*a*) Outline and illustrate several ways in which you have heretofore used the word "thinking."
   (*b*) What is the correct use of the term?
2. (*a*) Illustrate two clear examples of instinctive behavior in the lower animals.
   (*b*) Describe two clear cases of reasoning in man.

3. (*a*) To what extent would you say that the learning of a large vocabulary in any language enriches the associated ideas of the individual who uses that vocabulary?
   (*b*) To what extent is reasoning made more efficient through the possession of this vocabulary?
4. (*a*) What is meant by a *conscious* or *mental attitude?*
   (*b*) Distinguish between thinking and reasoning.
5. (*a*) Illustrate the typical idea as compared with the representative idea.
   (*b*) Define judgment.

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CHAPTER XII

THE SELF

"Within my earthly temple there's a crowd,
There's one of us that's humble, one that's proud;
There's one that's broken-hearted for his sins
And one that, unrepentant, sits and grins;
There's one that tries to lay up earthly pelf
And one that loves his neighbor more than self.
From much corroding care I should be free
If once I could determine which is me."
—M. W. Calkins, "The Good Man and the Good,"
a quotation from an old English song.

97. THE ULTIMATE ORGANIZATION OF EXPERIENCE

We have already discussed the fact that experiences become organized in an orderly fashion. Under the laws of attention some experiences stand plainly to view; others become more or less submerged in the conscious stream. Similarly under the laws of association we find that experiences become grouped together to form a coherent arrangement of mental processes from one moment to the next. Now when we survey the development of the mental life from birth until death we recognize also a definite unity of individual experience. The conscious life of an individual is organ-

ized into a complete whole. In other words, whatever events have taken place in the individual's lifetime, these are more intimately connected with all the other occurrences of that person's mental life than they are with the experiences of any other person. We live through a certain set of experiences on one day, go to sleep, and wake up the next morning, renewing the mental life as if no interruption had occurred. If we have dreamed during the night and have remembered our dreams they too become a part of our conscious life. The experiences of another person, while sympathetically understood, have never the same warmth or intimacy as have the experiences of one's own self. And so individuals grow mentally in terms of their own perceptions, emotions, actions and thoughts as trees in the forest independently develop root-systems, trunks, branches, and leaves. Such individual minds may be discussed in common as a class, just as trees become a forest; but they are organically separate beings.

In still another way this may be emphasized by saying that there are many individual differences in mental life. We have said that one individual marks himself off consciously from another individual by the warmth and intimacy of his own experiences as contrasted with the relative foreignness of other people's experiences. But through the application of objective methods of

testing mental ability, emotional reaction, mode of motor control, and the like, we are again able to say that one individual is a different self from another. We have even gone so far as to describe these differences in terms of what is called the *profile,* or psychogram,—as for example, in the description of musical talent where some factors have been analyzed out of the complex requirements of musical achievement and have been measured by scientific methods (*see* Fig. 15). Similarly, profiles like the "will" profile may be obtained from time to time for still other purposes and all of them will thus show characteristic individual differences in the mental make-up of the individual. As was discussed in one of the opening chapters the intensive study of these differences is the purpose of *individual psychology,* or what is also known as *differential psychology,* and some laboratories have devoted a score or more of years to the investigation of individual differences.

In psychological writings we have found still a third point of view in regard to the self and some confusion has resulted from the failure to distinguish this from the two foregoing problems. The notion of the self from this particular standpoint implies an experience of self in the sense of *self-consciousness.* In other words while there is an intimacy of one's own mental life and the objective portrayal in terms of mental tests for indi-

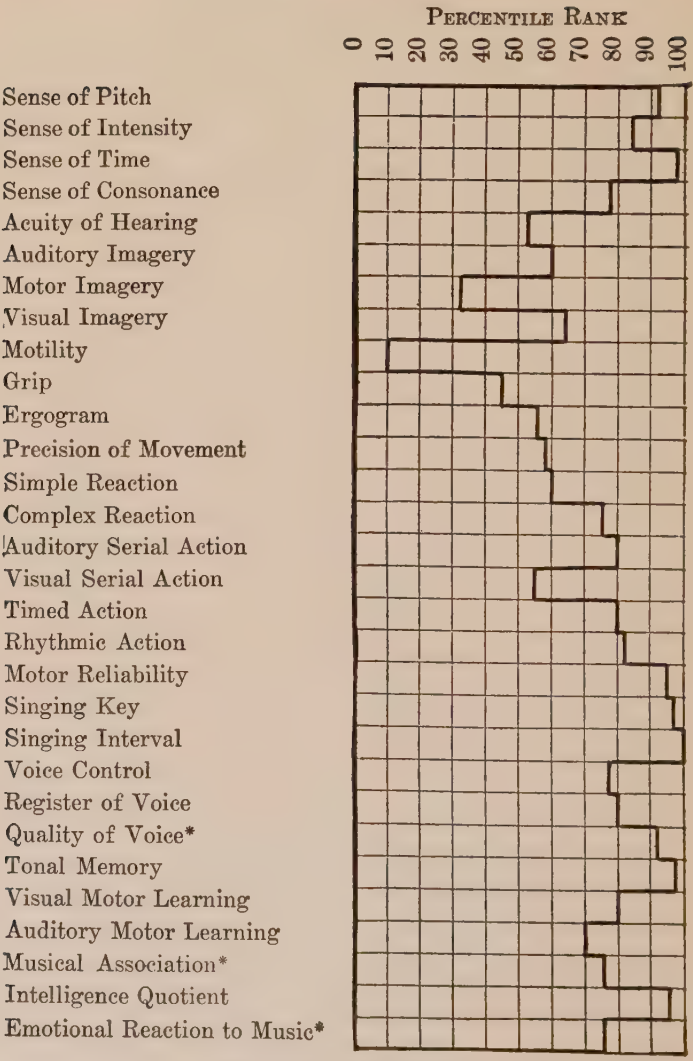

Fig. 15. A Psychogram

A Musical Talent Chart of an individual tested in the psychological laboratory. Asterisks indicate estimates.

After Seashore, "The Psychology of Musical Talent"

vidual differences, there still remains a third problem, that of experience of one's own self as a unique and perhaps indefinable individual. The question arises as to whether we are persistently aware of ourselves through all of our mental life, always conscious of our own personal existence, or whether at times at least we forget ourselves without even a lurking reference to the individual in the background of experience, as when we are buried in a project that demands our full attention and our maximal effort. It is difficult to decide this question for all time but we shall discuss it at further length in a separate section.

98. PERSONALITY

Hard as it is to discuss such terms as personality, soul, and character, we are nevertheless confronted with the problem of the personal aspect of experience. This is emphasized in clinical studies where distinctions within the personality sometimes become so great that new personalities arise in the same individual. But these abnormal cases of disassociated, multiple or altered personalities simply serve to emphasize the relatively minor changes that take place in all of us. To a certain extent we feel ourselves as different personalities, and others observe through our actions that we behave like different personalities, when the conditions of our mental lives have changed.

Thus all of us have from time to time a different set of reactions in terms of behavior but also a different set of associations, memories, and emotions depending upon surrounding conditions. When we are invited to a social affair which requires formal dress our behavior is much more formal than on occasions when we disport ourselves in the woods on a picnic. Physically we are the same individuals in both situations, mentally we are different. And in some cases those who do not know us well may even be surprised at the strangeness of our actions. The writer has seen many times the complete transformation which overtakes men when they are suddenly thrust into a new environment. Staid lawyers, bankers and business men when coming back for a class reunion act like boys having a jolly good time. Unfortunately, on the contrary, at a lynching or in a panic, civilized people usually well-behaved in society can act like savages or lunatics. Situations seem to arise which bring out from time to time different aspects of the individual in a way that makes him almost another individual.

Sometimes the influences come from the clothes he wears, sometimes from his fellow men, or sometimes from his physical environment. A priest unfrocked, a policeman with his uniform removed, a soldier without his regimentals, are no longer the individuals they were when prop-

erly clothed with the insignia of office. Evening clothes affect their wearers' behavior. In the same manner the effect of public opinion often makes or breaks the individual. Not only are we influenced by our garments but by the thoughts held by others concerning us. A man when ostracized in society receives a severe blow to his own personality. Some men are strong enough to withstand the result and some of these have become great,—not often in their own but in succeeding generations. But most of us, however, are dependent from time to time on the guidance of other people in the development of our own personalities. It is easy to be kind in the presence of kind people. It is difficult to be mean when conversing with a person who is generous and broad-minded. We say that we can tell an individual by the company he keeps. There is some foundation for this opinion, for in a mental sense the company "keeps" the man.

In still a third way the qualities of our personality are affected, namely, by the sheerly physical environment which surrounds us. In church we more naturally have lofty thoughts and are religious personalities. In the market place we are tempted to become scheming and calculating individuals. One of the big problems of our social life is to make one effect last over in another environment. It has often been said that we make

our Christian religion too much a matter of Sunday observance and too little a matter of everyday life. In the same way the environment of beautiful trees, the atmosphere of the marvelous sunset or the stupendous flow of Niagara Falls makes us for the time being noble and awe-inspired persons. On such occasions we feel sometimes that for the moment we have gone out of ourselves away from a world of petty differences and have transmigrated into a world of larger values. Many individuals under such conditions feel that they are merged into a larger whole. But whatever may be the interpretation it is safe to say that persons are affected in the awareness of themselves and in the manner of their behavior by such things as dress, public opinion, and physical environment.

99. MULTIPLE, DISASSOCIATED OR ALTERED PERSONALITY

We all know Stevenson's story of Dr. Jekyl and Mr. Hyde. Few of us realize, however, that this is by no means a bit of fiction, but a well-known occurrence in pathological cases. Occasions have arisen when the minor differences in personal reactions become so great that under neurological strain, mentally speaking, several persons may be said to reside in the same body. Under those conditions there is sometimes no reference from one individual's mental life to the mental

life of the other. There may be no memory in Mr. Hyde of what Dr. Jekyl has done or of the reverse. In other cases there is a slight association, sometimes only a "one-way" relation, between the lives of these individuals.

Perhaps the most famous case reported was reported in the literature under the name of Miss Beauchamp, who was in one of her personalities a very well refined, highly educated college girl. In another, as Sally, she was uncouth, slovenly, mischievous, and given to coarse language and behavior. In this same physical body there finally were altogether five more or less defined individuals present. Sally would often play tricks on Miss Beauchamp. She would string yarn about the chairs and pictures of the room, upset the tidy conditions of furniture and then turn herself into Miss Beauchamp who was accordingly horrified. She would ride on the street car with just enough fare for one trip and then at the end of the line would turn herself back into Miss Beauchamp without money to return. Cases somewhat like this famous one have frequently been reported from our hospitals for mental diseases. Some of them have been cured, as this one was, through hypnotic suggestion. Space does not here permit a lengthy discussion of such abnormal occurrences in a brief sketch of normal psychology, but these phenomena simply illustrate, perhaps by over-

emphasis, the natural tendencies of the human mind manifested more in some individuals than in others. Different sets of associations are often cultivated in quite normal circumstances in the same individual. Under the stresses and strains of some intense emotional experience which has greatly upset the individual, mind will frequently break up into several split-off groups of associations. Just as in everyday life a certain pattern of associations is immediately called up by factors in the environment,—as, for example, when we remember the name of certain streets in another city only when we are in that city,—so our mental lives may suffer disintegration and break up into smaller wholes, depending upon different sets of environmental situations.

100. CHARACTER

Like the term "personality," *character* is not strictly speaking a psychological term. It refers more particularly to social and moral spheres of activity. It is, in other words, a name given by society to the peculiar behavior of the individual, in terms of which he is known to and evaluated by his fellow men. The individual does not give himself the character except insofar as he chooses his personal habits from time to time, but the term is assigned by society to him on the basis of behavior and his explicitly or implicitly expressed

ideals. Like many other generally known traits, the traits of character, however, can be subjected to analysis through properly devised tests of capacity and training. This type of character analysis was first rather crudely attempted in a general way by such studies as those of handwriting, of contours of the head and face, of lines of the hand, of posture, gait, and a host of similar outward manifestations. We are not disparaging the significance of graphology, phrenology or palmistry when we note these historic interpretations, because undoubtedly they were the product of their own day in the light of what scientific knowledge was then at hand. But today, of course, there is little or no scientific evidence for them. It is as absurd to find the place for geniality in a man's character in some point in the head as it is to locate in some specific part of the motor-car the gracefulness of its lines. Further than that it is poor logic to say that, even if in general men of strong wills have a square jaw, every man with a square jaw has a strong will. The human child weighs a certain amount on the average at a certain age for his particular stature but the averages are made up of a great many variations and the individual who is underweight may therefore be just as healthy, or more so, in his own right as the child who is exactly equal to the average.

101. SOUL

In the beginning of the book we indicated that the term "soul" is no longer scientifically treated in textbooks of psychology. Its meaning has gone beyond the scope of scientific research. We have also stated that this does not necessarily imply our disbelief in the soul as spiritual individuals but simply asserts that psychologists are not competent to discuss the subject. For us mind begins at birth and ends at death, because we have so defined it and can only thus study it through present scientific methods. All of this means that we leave to others the complete description of the universe from whatever angle they may be trained to scan it. No one psychologist can give a complete story of the work of nature. Each scientist takes his station and views the world from a certain angle, giving it as sharp an analysis and as complete a description as his point of view will warrant. The philosopher brings together all of these points of view and tries to make a synthetic logical whole out of them. Psychologists are not philosophers or theologians and therefore must content themselves with a limited view of the reality of the universe.

102. PSYCHIC RESEARCH

Recently there has been a revival of interest in matters of *psychic research.* Attempts have repeatedly been made to communicate with living

fellow men through telepathic channels and outside of the usual media or methods that are known to science. Similar attempts have been made to communicate with individuals who are dead. In this country and abroad societies have been organized for the detailed study of such alleged phenomena and hundreds of books have been written on so-called spiritualistic manifestations. Large sums of money have been offered for scientific demonstrations of these phenomena but so far no proof satisfactory to science has been forthcoming. There are some aspects of experiments made upon children and animals which have not yet received a complete or convincing answer. Beulah Miller was able to tell what was in the pockets of people in the room, what cards they held; but the exact method used by her was never ascertained. In the same way the investigations of the supposedly highly intellectual Elberfeld horses did not remove all doubt as to the unusual means of communication with their trainer. Our attitude as scientific men, therefore, must be one of suspended judgment. The book of knowledge even in psychology is by no means closed. The last page has not been written. So we must admit that there are some things still to be investigated and explained. On the other hand, there has been to date no certain scientific demonstration of the truth either of telepathy or of the cognate ability to move objects at a distance, known as *telekinesis*. Of

course, just as in religious matters, any individual may not be willing to remain strictly scientific throughout every moment of his daily life, so here psychologists may wish to depart from the dictates of science and to believe in spiritualistic evidence on non-scientific grounds. There are some sincere and thoughtful people who go so far as to say that this type of evidence will never lend itself to scientific demonstration and must be taken on faith or on intuition.

103. SELF-CONSCIOUSNESS

Some psychologists have developed the position that a consciousness of self is persistent and personal throughout our daily experiences. In the words of one representative of this group, consciousness always "is a somebody-being conscious." On the basis of introspective evidence gathered from another laboratory this position is disputed. All turns apparently on the interpretation of the term "self-conscious." If it means that an individual is literally conscious of himself every time that he mentally turns around, certainly the statement can not be true. For we all recognize that there are moments when we are absolutely unaware of ourselves as when we are buried deeply in a problem, in a charitable enterprise, or even sometimes in the daily routine of our work. At this time we can not find even a

vestige of self-consciousness or reference to self in the background of our mental lives. On other occasions we are more or less definitely conscious of ourselves. Again it may be a matter of logic. In a logical sense, especially from the point of view of epistemology, it is true that there can not be a thing perceived without a person perceiving. But to the mind of the psychologist the requirements of logic should be separated as much as possible from experimental or observed fact.

Therefore it is properly assumed for the present that while there can be self-consciousness at times and in some individuals more than in others, it is not necessarily persistent. When it does appear self-consciousness seems to be made up in general of two important factors: (1) the persistent group of organic sensations from within the body, together with tactual and kinæsthetic pressures, warmths and occasional pains from our own organism, and (2) a constant backward reference from our own experiences of the moment to the experiences of yesterday. The first factor is important because while the scenery changes without we are constantly getting these organic, kinæsthetic and tactual sensations from our own bodies as a sort of fundamental ground tone over which is laid the variety of daily perceptual and ideational experience. In a similar way the second factor is important because if any sharp and em-

phatic interruption occurs in our memorial life a new personality may begin. Our past experiences are continuously linked up with our present mental life.

The manner in which an individual thinks of himself, of course, may be influenced by other factors, such as the sound of his own voice, the appearance of himself in a mirror or in a series of portraits and the descriptions given him by other people, including descriptions of his early life by his parents. Sometimes these happenings have so often been told in our presence that we feel confident of having had these experiences ourselves! Altogether this subject is one that requires further investigation, especially on the part of naïve observers, if such can be found outside of the influences of particular laboratory training.

104. SUMMARY

This final chapter has attempted to bring together in an organized fashion the many lines of discussion that have preceded it. We see that when all threads have been gathered the fabric of the mental life is not only quite complex and varied but in any individual case an organized unitary whole. Perceptions, emotions, actions and thoughts may exist in the abstract and be discussed in general terms but after all they are part and parcel of the individual mental life. This unitary charac-

ter of mind is exemplified not only in our own daily lives but it is reflected in the cases of abnormal subjects where disruption and disintegration take place. Approaches of this kind of dissociation are seen in the normal differences in the behavior of the individual from one environment to another. Frequently our official and professional selves are different from our "home" selves. When society evaluates our behavior it assigns us a certain average kind of character. The soul, on the other hand, is not subject to scientific analysis in the same way that even such less general terms as personality and character are, but must be left to others for description. Psychic research was found to present a problem which is not yet entirely answered nor for which there is any scientific evidence. And finally we saw that a question of self-consciousness must be answered in terms of actual introspective evidence rather than in terms of the logic of the situation.

And so we come back to where we started. Psychology was given a temporary definition but this formal statement could not be fully understood until the last chapter was presented. Altogether the reader may now have a more satisfactory picture of psychology than any concise definition could give. The impression must remain, however, that there is nothing mysterious or miraculous about the human mind in any other way than there

is something mysterious or miraculous about the beautiful trees of the forest. Each one of the phenomena of nature can be scientifically scrutinized and described, and so it is with the human mind. That it is a complete picture of what some people call the soul we do not assert just as no scientist is able fully to describe the beautiful elms in the streets of an old New England town. But we have been able by means of the study of psychology to perform valuable service in the educational, clinical, and industrial spheres of activity that could not have been rendered without an objective study of the human mind.

Even with these brief discussions behind us, there must come a feeling of vastness, a sense of want, a desire to travel farther into this region, and for some of us an eagerness to push on into the unexplored. To those readers who have gained their first impressions of psychology from this short account, a better understanding of psychology could be obtained from a visit to any one of scores of psychological laboratories throughout the country. When one sees students and staff actually at work on problems of the human mind, when one calculates that about $500,000 is spent annually in this country on new psychological apparatus and materials, that almost no academic institution is without its research problems in the field of mind, one is then better able to appreciate

what present-day psychology *is* and *is about,* and what are the discovered principles and laws of the mental life.

The writer has done no more than to usher the reader into the lobby of the research laboratory. It is too much to ask that such a visitor should learn all, or even very much, about psychology. It is not fair, moreover, to expect every last worker in his nook or at his desk to know what the whole of psychology is about. The great synthetic minds who systematically supervise the entire plant might have a vague idea of what that plant is trying to accomplish. But these men of comprehensive intellectual power, the men who really make a serious effort not only to keep in touch with the products of each section of the vast world-wide laboratory, but to organize the productive energy toward a common goal,—these men know too much to say much. We can no longer admit with Voltaire the slur pronounced in his diatribe when he says, "Unbending decider! pedagogue in phrases! furred reasoner! thou inquirest after the limits of the human mind:—they are at the end of thy nose."[1] Rather would we choose the position of the late G. Stanley Hall when he wrote: "In the views I have attained of man, his place in nature, his origin and destiny, I believe I have

[1] "Limits of the Human Mind," in A Philosophical Dictionary, 1843, Vol. II, p. 219.

become a riper product of the present stage of civilization than most of my contemporaries, have outgrown more superstitions, attained clearer insights, and have a deeper sense of peace with myself."[2]

REVIEW QUESTIONS

1. (*a*) Mention and illustrate three different types of organization of the human mind.
   (*b*) Under which type would "multiple personality" fall?
2. (*a*) In what sense is a person more highly organized at 50 years than at 25 years of age?
   (*b*) Discuss the disorganization of mind with extreme age.
3. (*a*) Distinguish mind, soul, personality, and character.
   (*b*) What positive and negative criticism can you offer in regard to psychic research?
4. (*a*) Illustrate from your own experience or from that of another the *normal* approach to a dissociated personality.
   (*b*) What is meant by a one-way association in the case of Dr. Jekyl and Mr. Hyde?
5. (*a*) Specify and illustrate three lines of suggestive influence that develop the personality.
   (*b*) Analyze the factors that produce self-consciousness when you are appearing before others in an audience or some other gathering of strangers.

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